

Jenway 6500/05

Spectrophotometer Service Manual

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1.1 About This Manual

This manual covers the service, maintenance, calibration and repair of the Jenway Ltd models 6500 and 6505 Spectrophotometers.

Throughout this manual all general statements and procedures should be considered to be relevant for both models. Where a statement or procedure is relevant to only one of the two models it will be clearly stated in *underlined italics*, to which model it relates, at the beginning of the relevant paragraph or section.

This manual must be used in conjunction with the Instruction Manual for these models, as many of the routine maintenance procedures detailed in the Instruction Manual are not repeated in this Service Manual.

1.2 Using This Manual

This manual is only for the use of Engineers and Technicians who have successfully completed a Jenway Ltd approved Service Training course on the 6500 and 6505 Spectrophotometers.

Updates to this manual will be circulated through the Jenway Ltd TSI (Technical Service Information) systems and to other registered users of this manual. Please complete the form at the rear of this manual to register your copy for future updates.

In practice Section 2 - Quick Reference and Section 8 – Maintenance, with the Diagrams in Section 9, will be most frequently used, however it is good practice to read the complete manual initially and review it again periodically.

To find the information required refer to the Main Index or Index to Sections to identify the relevant Section/page number required.

1.3 Warnings & Safe Practice

Disconnect the mains supply when any covers are removed as there are mains and high voltages present inside the unit that pose the risk of electric shock at levels that are hazardous to life!

Do not look directly at the light sources or allow the light beam to fall directly on the eyes, switch off or dim the lamps (as described in the procedures) whenever possible and wear UV eye protection at ALL times.

Both the UV and visible lamps get very hot when in use, always allow time for them to cool down before removing them. Always wear cotton gloves when removing faulty lamps and replacing them with new ones.

Finger marks, dust and condensation can quickly destroy sensitive and expensive optical components, always wear cotton gloves when the optical bench is uncovered and handle any components by their edges only. Never touch optical surfaces. Do not remove optical covers unless the unit is in a clean, dust and condensation free environment.

Many of the reagents, solutions and standards used for maintenance and calibration are corrosive or hazardous, ensure all precautions supplied with them are followed, where there is any doubt request a MSDS (Material Safety Data Sheet) from the supplier.

These instruments can be used for analysing a broad range of samples, do not handle them unless you are qualified to do so. Ensure that the instrument has been correctly decontaminated before working on it, specifically in areas where the instrument may have been used for clinical, biological, corrosive or radioactive samples.

1.4 Standards & Certification

No adjustments should be made to these instruments unless the test and measurement equipment, signal source or filters to be used have a current calibration certificate that is traceable to national or international standards and that it is known that this test equipment

is currently performing to the certified standards. All solutions and reagents should be fresh and within any stated shelf life with a certificate of analysis.

1.5 Ordering Spares

When ordering spare parts as detailed in this manual please quote the Part Number and Description. These items should be ordered from the original supplier of the equipment or your local Jenway Limited Distributor.

1.6 Returning Items

Should it be necessary to return any item for any reason then this should be done through the original supplier of the equipment or your local Jenway Limited Distributor.

1.7 Contacting Jenway Limited

Before contacting Jenway Limited please check our web pages for any information or updates that may be helpful to you.

www.jenway.com

Emails should be sent to sales@jenway.com

Fax: +44 1371 821083

Phone: +44 1371 820122

Please note no items can be returned (or will be accepted by) Jenway Limited without a Returns Authorisation number (RA number) and a completed Safety Clearance and Decontamination certificate.

2.0 About 'Quick Reference'

This section contains a selection of the key information that is often forgotten or difficult to find when required. Use Quick Reference as a memory jogger, but for more information check out the references to the main sections on each point.

2.1 Specification

Wavelength Range	<u>6500</u> 320nm to 1100nm <u>6505</u> 190nm to 1100nm
Wavelength Resolution	0.1nm
Wavelength Accuracy	1nm
Spectral Bandwidth	1.8nm
Light Source	Visible; Tungsten Halogen Ultra Violet; Deuterium
UV Lamp Auto Off	Selectable 320nm to 390nm
Optics	Split Beam
Transmittance	Range; 0 to 199.9% Resolution; 0.1%
Absorbance	Range; -0.300A to 3.000A Resolution; 0.001A
Concentration	Range; -300 to 9999 Resolution; 0.001, 0.01, 0.1, 1 Units; ppb, ppm, $\mu\text{g l}^{-1}$, mg l^{-1} , g l^{-1} , M, %, blank.
Spectrum	Abs. %T or Conc. Against wavelength

Scan Interval	Scan Speed
5nm	1200nm/min
1nm	400nm/min
0.2	166nm/min

Stray Light	Less than 0.05% @340nm
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2.2 Main Sub-Assemblies

650 004 Top Case Assembly – includes the following...

640 058	Keypad
650 021	Operating System on PCMCIA Card
650 006	Microprocessor PCB
012 092	LCD Module

650 504 Lower case Assembly – includes the following...

640 025	Power Supply PCB
640 516	Deuterium Power supply PCB
650 505	Detector PCB
650 012	Mouse Interface PCB
644 001	Multi-cell Changer with PCB
060 342	Cooling Fan
010 039	Torroidal Transformer

Optics Assembly – includes the following...

012 075	Tungsten Halogen lamp
640 508	Deuterium Lamp
650 507	Monochromator assembly
650 010	Beam Splitter PCB
032 005	12V Solenoid

Other Items – including...

060 358	Mouse
016 058	1.6A Fuse for 220V supply
3.15A	Fuse for 110V supply

2.3 Power Supply Voltages

Before commencing more complex fault finding it is important to check all the internally generated supply voltages are correct. The following list is a useful guide to help quickly check these are functioning correctly. Not all the points where these voltages can be measured are given and where the voltage is stated as unregulated variations may occur. In general regulated supplies should vary by no more than $\pm 5\%$ from their nominal value.

Tungsten Lamp Supply, 12V dc regulated and set by VR1, measure at PL5 pin 3 with respect to PL5 pin 4 on the power supply PCB and at the terminals on the lamp base with the lamp fitted.

Solenoid, Relay and Fan Supplies, 12V dc regulated and pre-set, measure at PL5 pin 1 with respect to PL5 pin 2 on the power supply PCB and on the solenoid and fan terminals and at the cathode of D3 on the Deuterium Power supply PCB with respect to 0V.

Digital Supply, 5V dc regulated and pre-set, measure across C17 on the power supply PCB and across C62 on the microprocessor PCB.

Stepper Motor Drive, 30V dc unregulated, also acts as unregulated supply for all above, measure between Star3 and Star 2 on power supply PCB.

LCD Supply, -18V dc regulated and pre-set, measure across the outside pins of REG. 5 (7918) on the power supply PCB.

DAC Supply, 12V dc regulated and pre-set, measure across the top two pins of REG. 4 (7812) on the power supply PCB.

Deuterium PCB Supplies, 24V dc unregulated, measure across the top two pins of REG1 (7812) on the Deuterium Lamp Supply PCB. 12V dc regulated and pre-set, measure across the bottom two pins of REG. 1 (7812) on the Deuterium Lamp Supply PCB. 5V dc regulated and pre-set, measure across pins 4 and 8 of IC1 (LM311) on the Deuterium Lamp Supply PCB. 30V dc unregulated, measure from the top of R120 (junction with R100) with respect to the top of R102 in the centre of the Deuterium Lamp Supply PCB. 14V dc

regulated and pre-set, measure from the top of R101 with respect to the top of R102 on the Deuterium Lamp Supply PCB.

Deuterium Lamp Heater, 2.5V dc (1.0V when arc has struck) regulated and pre-set, measure across R9 on the Deuterium Lamp Supply PCB or between the two blue wires on pins 2 and 3 of the Deuterium Lamp Socket (SK1).

Deuterium Lamp Arc, 170V dc pulsed to strike, 300mA at 70V (Temperature Compensated) when arc has struck. Measure across R119 on the Deuterium Lamp Supply PCB and between pins 1 and 3 on the Deuterium Lamp Socket (SK1).

Detector PCB Supplies, 5Vdc regulated and pre-set, measure across D2 on the Detector PCB. -5V dc regulated and pre-set, measure across D3 on the Detector PCB.

Sampling Accessory PCB, 5Vdc regulated and pre-set, measure across C15. 15V dc regulated and pre-set, measure between R18 at junction with REG 2 and junction of D1 and C22.

2.4 Signal Levels

All analogue signal processing is dealt with on the Detector PCB and the Beam Splitter PCB. Relevant signals from these PCBs are shown in the Diagnostics Screen as Linearised Voltage, in mV, and CH0, CH1, CH2 and CH3 or CH4 in 'counts' directly from the A to D converter. For more detailed definitions of these terms see Section 5.3 - Detector Circuits and Section 7.01 – The Diagnostics Menu, 7.02 – Linearised Voltage and 7.03 Channel Outputs.

The Linearised Voltage can be used to check lamp energy (ageing), the correct functioning of the IR Stray Light filter and the UV Stray Light Filter as well as the Dark Shutter.

U V Energy, Set wavelength to 190nm, Dark Shutter open, IR stray light filter closed, UV stray light filter open; Linearised voltage must be greater than 20mV.

Visible Energy, Set wavelength to 700nm, Dark Shutter open, IR stray light filter open, UV second order stray light filter closed;

Linearised Voltage must be greater than 1000mV and less than 3400mV.

Dark Current, Set wavelength to 320nm, Dark Shutter closed, IR stray light filter closed, UV second order stray light filter open; Linearised Voltage should be zero +/- 6mV.

320nm Output, Set wavelength to 320nm, UV lamp off, Dark Shutter open, IR stray light filter closed, UV second order stray light filter open; Linearised voltage must be greater than 17mV. Typical values for units fitted with the Richardson grating (Serial Numbers greater than 2000) are 40mV, for those fitted with the American Holographics grating (Serial Numbers less than 2000) typical values will be 17 to 20mV.

Beam Splitter Dark Current, Set wavelength to 320nm, UV lamp off, Dark Shutter closed, IR stray light filter closed, UV second order stray light filter open; CH4 should be zero +/- 100 counts.

Beam Splitter Output, Set wavelength to 320nm, UV lamp off, Dark Shutter open, IR stray light filter closed, UV second order stray light filter open; CH4 should be greater than 250 counts but less than 1000.

2.5 Error Codes

A number of dialogue boxes are generated with messages relating to fault conditions, these are detailed below with a brief description of some of the most common causes for these errors.

Dark Level Too High, Sample chamber cover left open during start up tests or a calibration, dark shutter stuck open, solenoid or solenoid drive/connections faulty, Detector PCB failure.

Light Level Too Low, Blank too optically dense, plastic or glass cuvettes used in the UV range, miss-alignment of cell carriage, wrong lamps fitted, lamps miss-aligned, dark shutter stuck closed. This may also be due to the contamination of optical surfaces.

Unable To Detect Peak Light Level, Cuvette left in sample chamber during start up tests, miss-aligned cell carriage, wrong

lamps fitted, miss-aligned lamps or lamp carriage, contaminated optical component.

Unable To Detect Sensor Vane, Grating position opto-coupler faulty or connections broken/intermittent, incorrect wavelength calibration carried out, check connections to stepper motor and check PL3 connections on Power Supply PCB.

Calculated Factor Outside Limits, The standard used to calibrate a concentration measurement cannot give the standard value entered, this can be because the standard is too optically dense or too similar to the blank. Alternatively the incorrect standard value may have been entered.

Warning Tungsten Lamp Failure, Tungsten lamp filament broken, wrong type of tungsten lamp fitted, no tungsten lamp fitted, cables to lamp base broken/damaged, check SK4 on power supply PCB.

Warning Deuterium Lamp Failure, Deuterium lamp faulty, cable disconnected, 6500 set up as 6505.

Critical Error Calibration Data Failure, During the start up test sequence the microprocessor has been unable to detect the calibration data stored in the E²PROM on the Detector PCB. This may indicate a faulty Detector PCB or that the connections to the Detector PCB are not made or are intermittent.

Critical Error Wavelength Failure, Monochromator has received a command to drive the grating to a wavelength outside the range of -200 to 1200nm, problem can only be produced by incorrect use of functions in the Diagnostics Mode. It may also happen through software corruption, recover by deleting all files and re-loading the executable programme from the application card supplied.

2.6 Special Key Functions

There are a number of special key functions for use by trained engineers, do not use them unless you are fully conversant with all the procedures these invoke.

Power On Reset, Hold the <Enter> key depressed while turning on the power. This resets the default operating parameters, it does not clear all the memory but is useful in correcting many software conflicts.

Software Version, The version of software loaded (i.e. Version 1.4 etc) can be displayed by pressing the <+/-> key when the main menu screen is active.

Skip Power On Tests, Hold the decimal point <.> key depressed while turning the power on, this function must only be used for fault finding procedures, taking readings on an instrument started in this way will produce unpredictable errors.

Diagnostics Mode, Hold the right arrow <>> key depressed while turning the power on, do not enter this mode unless you have the correct training and equipment, making adjustments here can permanently damage the instrument.

6500/6505 Select, Pressing the right arrow <>> key in the diagnostics mode will invoke the 6505 software modules, pressing the left arrow key <<> will invoke the 6500 software modules. Of course a 6505 can be run as a 6500, but errors will occur in the opposite situation, ensure the correct option is selected before leaving the Diagnostics Menu.

Load New Application, Hold down the zero <0> key while turning the power on, do not do this unless you have an up to date application card to re-load, invoking this function is irreversible, if in doubt use the Load New Application function in the Instrument set Up Menu. Using these short cut keys for loading a new application does not reset the user variables stored in battery backed RAM. If the new application is significantly different from the previous one, then these user variables may be misinterpreted. It is good practice to always follow this action with a power on reset that will set the user variables to their default values.

2.7 Test Solutions

1. Wavelength Standard

Holmium Perchlorate – 5% w/v solution of Holmium Oxide in 1.4N Perchloric acid, this will give absorbance maxima at 241.0, 278.1, 287.0, 361.4, 416.1, 451.1, 485.3, 536.5 and 640.5nm.

2. Absorbance Standard

Potassium Dichromate – 100.0mg/l in 0.005M Sulphuric Acid (use the Sulphuric Acid as the blank). This will give Absorbance values of 1.071 at 350nm, 0.484 at 313nm, 1.444 at 257nm, 1.242 at 235.

Potassium Dichromate – 50.0mg/l in 0.005M Sulphuric Acid (use the Sulphuric Acid as the blank). This will give Absorbance values of 0.536 at 350nm, 0.242 at 313nm, 0.722 at 257nm, 0.621 at 235.

3. Stray Light Standard

Sodium Nitrate – 50g/l in deionised water, should give less than 0.1% transmittance at 340nm.

Sodium Iodide – 10g/l in deionised water, should give less than 0.1% transmittance at 220nm.

WARNING

All these solutions are hazardous and the manufacturer/suppliers safety precautions should be carefully followed at all times in preparation, use and storage.

Section 3

System Description

3.1 6500 & 6505 Comparison

3.2 Executable Programmes

3.3 Sub-Assemblies

3.4 Accessories

3.5 Outputs

3.1 6500 & 6505 Comparison

The models 6500 and 6505 share the majority of common sub-assemblies. However the 6500 is not fitted with the Deuterium Lamp power Supply PCB and of course the Deuterium Lamp itself.

Because of this the optics and monochromator are slightly different, but in arrangement only.

The Detector and Detector PCBs are specific to each model, 650 008 for the 6500 and 650 505 for the 6505.

3.2 Executable Programmes

Both models use the same executable programme, which can be updated by re-loading new versions from a Flash memory card inserted in the PCMCIA card slot. A back-up copy of this executable programme, on an application card, is included when the units are supplied.

The mouse driven system makes both of these models very user friendly, but operation is still possible using the navigation keys on the keypad and the short cut icons on the display.

The PCMCIA card slot may also be used for storing results and methods on an SRAM card and when stored as ASCII files these can be transferred to a PC for further manipulation or storage.

3.3 Sub-Assemblies

The 6500 and 6505 can easily be broken down into sub-assemblies for the purposes of repair or replacement. All the PCBs are easily removed, see Section 8.2 – Dismantling. The monochromator and lamp carriage, which together contain most of the optical components are both replaceable sub-assemblies. There are a number of sampling accessories that can be fitted into the sample compartment and removed with very little dismantling.

See Section 2.2 for details of the main sub-assemblies and Section 11 for details of other spare parts. The following paragraph lists the sampling accessories available.

Section 4

Optical Description

4.1 Light Sources

4.2 Stray Light Filters

4.3 Grating

4.4 Beam Splitter

4.5 Signal Detector

4.1 Light Sources

The model 6500 uses a single Tungsten Halogen lamp to cover its full wavelength range of 320nm to 1100nm.

The model 6505 uses the same Tungsten Halogen lamp with a 'see through' Deuterium lamp to cover its wavelength range of 190nm to 1100nm.

The use of the 'see through' Deuterium lamp enables both lamps to be on in the low energy area, found at high UV wavelengths, reducing the typical energy dip. It also eliminates the spikes created in systems that use a lamp changeover mirror.

It is still possible to switch off the Deuterium lamp to save lamp life when working only in the visible region and the 'switch off' point can be selected between 320nm and 390nm.

The lamps are both pre-aligned and can be simply replaced by removing the lamp carriage after the lamp access panel has been removed. See Sections 4.2 and 4.3 of the Instruction Manual.

4.2 Stray Light Filters

6505 The 6505 uses three stray light filters.

The first filter is located between the Tungsten and Deuterium lamps. This filter is solenoid actuated and is switched into the light path between 0nm and 390nm to eliminate unwanted Infra Red light.

The second filter is located after the Deuterium lamp, inside the monochromator, is solenoid actuated and is switched into the light path between 390nm and 1100nm to eliminate unwanted UV light.

The third filter is mechanically linked to the grating mount and is in the light path between 550nm and 1100nm to eliminate unwanted second order diffraction.

6500 The 6500 uses two stray light filters

The first filter is located after the tungsten lamp inside the monochromator. This filter is solenoid actuated and is switched into the light path between 0nm and 390nm to eliminate unwanted Infra Red light.

The second filter is mechanically linked to the grating mount and is in the light path between 550nm and 1100nm to eliminate unwanted second order diffraction.

4.3 Grating

The 6500 and 6505 optics use the same grating, this is a concave holographic grating with 1200 lines per mm

Early units used an American Holographics grating but from serial number 2000 a Richardson grating was used for enhanced UV performance. The grating is directly coupled to the stepper motor, which is under microprocessor control, thus reducing backlash and mechanical errors.

4.4 Beam Splitter

Just before the light beam passes into the sample chamber a small proportion of the light (about 15%) is reflected downwards by a beam splitter. This 'split beam' is focused on to the reference detector, and the voltage generated is used as a reference to compensate for any drift or variation in the light sources or other optical components that precede the beam splitter.

The remaining proportion (85%) passes through the sample in the sample chamber and on to the signal detector.

4.5 Signal Detector

Photo diode detectors are used on both models, an S1133 type on the 6500 and the UV enhanced version S1337 on the 6505.

The detector PCB carries out all the analogue signal processing and each one carries its own calibration data stored in an on-board E²PROM. For more information see Section 5.3 – Detector Circuits.

Section 5

Electronic Description

5.1 Power Supplies

5.2 Deuterium Lamp Supplies

5.3 Detector Circuits

5.4 Microprocessor and Memory Functions

5.5 Mouse Driver & Parallel Port

5.6 Accessory Driver PCB

5.1 Power Supplies

The ac mains supply is reduced by the torroidal transformer giving five low voltage outputs from the secondary windings. Each secondary is protected by a re-settable fuse which will go open circuit when excess current is drawn, when the current is reduced to normal the fuse will re-set. A 5A fuse is fitted for the 20V winding, 0.2A fuses for the 15V and 9V windings and 2.5A fuses for the 16V and 18V windings.

The 20V ac output from the transformer is rectified by D1; the 30V dc output from this rectifier is used as the input to three L4960 switch mode regulators. (REG1, REG 2 and REG 3).

Tungsten Lamp Supply, The output of the switch mode regulator REG 3 is set to 12V dc by VR1. The 10K NTC thermistor (R22) adds temperature compensation to this output voltage reducing warm up time and thermal drift. The 12V output can be reduced to 5.1V by a logic '1' on the gate of TR5 switching TR3. This happens during the start up tests to reduce the light level for accurate zero order detection, it can also be manually instigated by pressing key 5 when in the Diagnostics Menu. Increased current flow through the 0V return from the lamp is detected by TR1 to confirm that the lamp is functioning (i.e. the lamp filament is intact).

Solenoid, Relay and Fan Supply, The output of the switch mode regulator REG2 is pre-set to 12V. The output to the two fans is via PL12 pin 1 and 2 and PL5 pins 1 and 2.

The output to solenoid 1 (Dark Shutter) is via PL1 pin 1 and it is switched on when SK4 pin 27 goes high, this switches TR2 to make PL1 pin 4 low.

The output to solenoid 2 (IR Stray Light Filter) is via PL1 pin 2 and it is switched on when SK4 pin 22 goes high, this switches TR4 to make PL1 pin 5 low.

The output to solenoid 3 (UV (Second Order) Stray Light Filter) is via PL1 pin 3 and it is switched on when SK4 pin 14 goes high, this switches TR6 to make PL1 pin 6 low.

The 12V supply to the UV strike relay goes via SK9/PL9 pin 6 to the Deuterium Lamp supply PCB where it is tracked to the relay. The relay is switched when SK4 pin 23 goes high switching TR7 to make SK9/PL9 pin 7 low.

5V Digital Supply, The output of the switch mode regulator REG 1 is pre-set to 5V and the output is distributed via SK4 pin 1.

The 15V secondary winding of the transformer is half wave rectified by D5 and D6 to generate the following supplies:

LCD and DAC Supplies, The 7918, -18V regulator gives a -18V output on SK4 pin 28 this is then routed to the LCD supply. The 7812, 12V regulator gives a 12V output. This is tracked to IC200, and the associated circuitry that makes up the DAC. Calibration data for the DAC is stored in the E²PROM IC201.

5.2 Deuterium Lamp Supplies

In the Deuterium lamp the gas is initially heated by an element powered at 2.5V. An arc is struck between the Anode and cathode at around 750V, when the arc is established it is maintained at a constant current of 300mA at 70V while the heater voltage is reduced to 1V.

A local supply of 12V dc is generated from the 16V ac winding of the transformer. This 12V supply is then used to generate a regulated 5V supply.

The 20V ac winding of the transformer is used to generate an unregulated 30V supply.

The boost regulator circuit based around the pulse width modulator IC100 uses this 30V to generate a 170V supply. This supply is then switched across the auto-transformer L2 by relay RLY1a to increase this voltage to about 750V, sufficient to strike the arc.

When the arc has been struck IC101a and TR100 maintain the current at 300mA. Power is kept to a minimum at varying temperatures by R122, a 10K NTC Thermistor.

TR101 detects the current flow and an output is sent to the microprocessor via PL9 pin 11.

The heater voltage is generated by the high side driver IC2, this will be 2.5V until a signal from the microprocessor, isolated by IC3 switches the comparator IC1a, which in turn reduces the heater voltage to 1V. The watchdog IC4 ensures that the comparator is continually updated.

5.3 Detector Circuits

Detectors and Amplifiers

One of two photodiode detectors is fitted to the PCB, either a S1133 for the Model 6500 or the UV enhanced version S1337 for the 6505.

The current through the detector is proportional to the incident light. IC3a acts as a current to voltage converter, the gain being set by the feedback resistors in the T network.

IC1 is a low pass filter that attenuates frequencies of 50Hz or greater from the signal. In normal operation pins 3 and 4 of SK2 are linked so the signal passes to the three remaining amplifiers of IC1. IC1b is set for unity gain, IC1c has a gain of 10 and IC1d a gain of 100.

A to D Conversion

Each of these amplified signals then pass into the first three channels (CH0 to CH3) of an 8 channel, 12 bit, serial, A to D converter.

All three channels are converted and the microprocessor selects the channel that gives the best resolution without reaching saturation (32767 counts). In effect this means CH2 will be selected for inputs up to 40mV, CH1 for inputs up to 400mV and CH0 for inputs up to 4.0V.

The A to d converter requires a reference voltage of 4.096V which is generated from the -5V rail by D4, this is inverted to a positive value by IC5d and fed to pin 14, Ref+, of the A to D converter, IC2.

executable programme, from a flash memory card, via the PCMCIA card slot.

RAM

User Variables that are input during operation are stored in battery backed RAM (IC6 and IC7 supported by Bat 1). User variables are data generated from operator input for values such as wavelength limits for scanning, calibration data for concentration and quantitation measurements, run time for kinetics etc, etc. These values can be re-set to their factory set default values by the Reset Parameters function in the Instrument Setup Menu or by performing a power on re-set, see Section 2.6, Special Key Functions.

IC8 and 9 are also battery backed RAM but here they are formatted as a virtual Disc for the storage of operator generated methods and results. These can be copied to an SRAM data card connected to the PCMCIA card slot. The data stored in IC8 and 9 can only be erased using the 'Reformat Media' command in the Filing System menus or by the on-screen icon.

IC13 is the SRAM (battery backed RAM) address decoder which selects either the standard battery backed RAM or the Virtual Disc under control of the microprocessor.

IC10 and 11 are the local high-speed memory used by the processor for the temporary storage of data during the execution of the programme.

Peripherals

Active time and date information is generated and stored by the real time clock IC14, the data stored here can be re-set through the 'Clock Setup' function in the 'Instrument Setup' menu.

IC12 is the 'watchdog', which monitors the supplies and re-sets the instrument if these fall below critical levels.

Microprocessor

IC1 is the microprocessor, which has 16MB of memory and runs at 16MHz using a traditional, Von Neuman, CPU architecture with bus mapped peripherals. I/O address decoding is via IC2.

I/O Buffers/Drivers

IC25 is an Octal, TriState Buffer for keypad input, three further scan lines are available from IC26 giving a total capacity of 24 keys, 20 are currently utilised.

IC26, 27 and 28 are output latches that drive the relevant peripheral as detailed below:

STROBE	Parallel Printer Interface
SOL3	UV, Second Order Stray Light Filter
SOL2	IR Stray Light Filter
SOL1	Dark Shutter
LAMP VOLTS	Select visible lamp voltage (12/5V)
MOTORI0	Select stepper motor current
PRINTERTXD	Internal printer data transmit
MOTORPHB	Stepper motor phase direction control
MOTORPHA	Stepper motor phase direction control
MOTORPHB11	Stepper motor phase current control
MOTORPHA11	Stepper motor phase current control
UVSTRIKE	Select UV lamp strike voltage
UVHEATER	Select UV lamp heater voltage

The outputs from IC28 are not used on these models.

IC29 is the output latch for the parallel and mouse interfaces,

IC30 is the RS232 interface.

IC31 is not used on these models

Display Drive, Contrast and Backlight

IC35 is the video display driver chip, IC36 and 37 are DRAM memory devices that hold the display pixel and grey scale data.

IC38 and 39 with VR1 and TR1 form the display contrast adjustment circuit. This is pre-set in manufacture and should need no further adjustment, as it is temperature compensated by TR1 to adjust by 40mV per degree Celsius.

IC40 (or 41) act as a voltage doubler for the 18V LCD supply from the Power Supply PCB, giving a -36V supply to the video graphics module. The 18V ac winding from the transformer is rectified then regulated to 5V by REG1 to give a local supply to the 'piggy back' PCB that drives the compact fluorescent backlight for the display.

5.5 Mouse Driver and Parallel Ports

The parallel port control lines are routed via IC1, from the 25 way D socket to the 20 way IDC connector PL1. Similarly the data lines are routed via 100 ohm resistors.

The mouse driver is based on an RS232 serial driver with power supplied via IC2.

5.6 Accessory Driver PCB

Both 6500 and 6505 models are supplied with the standard Accessory Driver PCB fitted. This is capable of driving all internal sampling accessories. Supplies and controls are also available to drive external accessories such as the peltier/sipper accessory.

Local supplies of 5V and 12V are generated from the 18V ac winding of the transformer.

The Accessory Driver PCB has it's own on-board micro-controller which has a permanent master/slave relationship with the main microprocessor.

The Accessory Driver is on the Serial Peripheral Interface Bus (SPIBus) and is selected by the CSACC line.

The on-board E²PROM maintains calibration data for the fitted accessory. In the case of the multi-cell changer this includes the number of steps on the stepper motor from the sensor vane to the first sample position. This will vary from accessory to accessory, so the PCB and mechanical assembly must be treated as a matched pair in this instance.

Section 6

Software Description

6.0 Warning

6.1 Start Up Routine

6.2 Main Menu

6.3 Set Up Menus

6.4 Filing System

6.0 Warning

This section gives an overview of the software modules, it is not meant to be a detailed analysis of the software routines or code. Also it must not be treated as a substitute Instruction Manual, its purpose is to enable basic navigation through the operational and set up modes sufficient to verify basic operation.

6.1 Start Up Routine

When the power to the unit is switched on a self-test routine is activated. This routine can be bypassed through the special key functions, see Section 2.6. The following parameters are checked and must pass before operation can continue:

System Test: - This test checks the status of the user variables stored in battery backed RAM and the calibration data stored in the E²PROM on the Detector PCB. This test will be failed when a new executable programme is loaded on an application card via the PCMCIA card slot, as it can not be guaranteed that previously stored user variables will be relevant to the new executable programme. This is not a fatal error but a warning message will advise that 'Default operating parameters have now been loaded' and will require acceptance before continuing. (Note; using short cut keys to load the new application does not re-set user variables therefore the above warning is not displayed and these variables may be misinterpreted, always carry out a power on reset if using this short cut.)

This test will also be failed, as above, following a power on re-set using the short cut keys, acceptance of the warning will enable normal operation to continue in this case too.

This test will also be failed if the calibration data has been corrupted, in this case a warning message 'CRITICAL ERROR. Calibration data failure, Please consult your dealer' will be displayed. This failure will be due to a faulty Detector PCB or due to broken/damaged connections to the Detector PCB.

Tungsten Lamp Test: - This test checks for current flow through the tungsten (visible) lamp filament. This test will be failed if the lamp filament is broken (bulb blown), if the lamp is not fitted, if an incorrect lamp is fitted, if connections to the lamp base are faulty

or broken or if the 12V supply to the lamp is faulty (power supply PCB).

Dark Level Test: - This test checks that the output of the detector is below a threshold level when there is no light falling on it. This test will be failed if the sample chamber lid is left open during the start up routine, if the dark shutter (solenoid 1) is faulty (electrical or mechanical) or if the Detector or Detector PCB is faulty.

Wavelength Calibration: - This test checks for the zero order (white) light that is reflected through the sample chamber when the grating is in a position where it acts as a mirror. Each time the unit is switched on this position is used as a physical reference point against which the stored wavelength calibration data is applied.

This test is carried out in the following manner; the microprocessor instructs the grating to drive anticlockwise by 1250nm. This should ensure that the vane attached to the grating mount breaks the light path of the optocoupler mounted on the monochromator base plate. If it does not receive a signal from the optocoupler then an error message 'Unable to Detect Sensor Vane' is returned when the motor stops.

In correct operation a signal is returned when the vane reaches the optocoupler. Then the microprocessor instructs the grating to rotate clockwise in 1nm steps for 200nm, or until a signal greater than 200mV is returned from the detector (this level, with the lamp dimmed can only be produced by the white zero order light). If this 200mV level can not be achieved then the grating stops after having rotated the 200nm and an error message 'Unable to Detect Peak Light Level' is returned.

In correct operation when this 200mV level is detected the grating rotates in the same direction for a further 200nm but in 0.2nm steps. A wavelength/output table is generated as the output increases, and then decreases back to 200mv. If the grating rotates the full 200nm without the output falling back to 200mV then the error code 'Unable to Detect Peak Light level' is returned.

In correct operation when the 200mV level on the other side of the peak is reached, the actual peak wavelength level is picked from

the table. This point is then set as the zero order level and the stored calibration data is referenced against this point.

This test will be failed if samples or cuvettes etc are left in the sample compartment during the start up routine, if the sample holder or sampling device in the sample chamber is incorrectly fitted/aligned such that it obscures the light beam. Also if the incorrect lamp is fitted, if the lamps or lamp carriage have not been fitted correctly, if the dark shutter is (stuck) in the closed position or through contamination, degradation or misalignment of other optical components.

Deuterium Lamp Test: - This test checks for the current flow that occurs when the arc in the Deuterium lamp has been struck. This test will be failed if the Deuterium lamp is faulty, if it is not fitted/connected or if the Deuterium lamp supply PCB is faulty.

Acquiring Baseline: - This test scans the full wavelength range of the instrument in 5nm increments and stores the data as a raw baseline. This baseline should not be used during operation when a new baseline should be run against the specific experimental data. Failure of this test is unlikely but errors may occur if cuvettes or samples are left in the sample chamber or the sample chamber cover is opened during the test.

6.2 Main Menu

When the Start Up Routine tests have been successfully completed the display defaults to the Main Menu screen. This details the five measurement types that can be carried out.

Photometrics: - This mode of operation will measure simple Absorbance, Transmission, and Concentration. The display will show the main value selected as well as the wavelength. See Section 3.2 of the Instruction Manual for more details.

Spectrum: - This mode of operation will measure changes of Absorbance, Transmission or Concentration over a selected wavelength range. The results are displayed in graphical form but tabular data is available. See Section 3.3 of the Instruction manual for more details.

Kinetics: - This mode of operation will measure changes of Absorbance, Transmission or Concentration over selected time

periods. The results are displayed in graphical form but tabular data can be accessed. See Section 3.4 of the Instruction Manual for more details.

Multi-Wavelength: - This mode of operation will measure the Absorbance or Transmission at up to 4 discrete wavelengths. The results are shown in tabular form and various calculations can be performed on the data returned. See section 3.5 of the Instruction Manual for more details.

Quantitation: - This mode of operation will measure Absorbance or Transmission and convert the value to a Concentration against a complex calibration curve, plotted against up to 20 standards, with the ability to manipulate and correct the curve. See section 3.6 of the Instruction Manual for more details.

Other than clicking on the required 'radio button' to enter the selected mode of operation the only other action that can be taken on this screen is to press the +/- key to display the current software version.

NOTE: - It is good practice to only turn the power off after having returned to the Main Menu screen, this will always ensure that all store/retrieve and other filing routines are complete. Turning power off while such functions are still being executed will lead to file corruption (which can only be recovered by reformatting the internal memory), invalid data and possible instrument failure.

6.3 Set Up Menus

There are two types of Set Up menus available from the Options Menu (click on Options at the bottom of the screen or right click at any time). These are Instrument Set Up and Mode Specific Set Up. The Instrument Set Up menu always remains the same, however it does include the Accessory Set Up sub-menu which is interactive, dependant on the accessory that is fitted. The Mode Specific Set Up Menu will vary dependant on the mode that had been selected prior to selecting the Options Menu. For instance if the Photometrics mode had been selected prior to selecting the Options Menu then it will include Photometrics Set Up, if Kinetics had been selected then it would include Kinetics Set Up etc.

Clicking on a menu selection will normally bring up a dialogue box with a message or selection option. Where the menu selection is followed by three dots (...) this indicates that there is a sub-menu or a number of options to be selected, as with 'Automatic Results Log...'. See Section 3.1 of the Instruction Manual for details of the Instrument Set Up menu.

The Mode Specific Set Up menus are detailed in the following sections of the Instruction Manual: -

Photometrics	Section 3.2
Spectrum	Section 3.3
Kinetics	Section 3.4
Multi-Wavelength	Section 3.5
Quantitation	Section 3.6

6.4 Filing System

The filing system covers the storage and retrieval of results and methods, it has important functional relationships with both the Storage Media and the Printer that have been selected.

It is impossible to state how many results or methods can be stored, as the required capacity for a simple Photometrics result is much less than that required for a high resolution spectrum scan. However an icon on the display will show how much space is available on the currently selected storage media.

Methods and Results are stored with a filename of up to 8 alphanumeric characters, if a filename exists with a greater number of characters or has non-alphanumeric characters then this is a good indication that the file it relates to has been corrupted. Correction may be possible by deleting the file but it may be necessary to re-format the relevant storage media to clean it up completely.

The difference between saving or printing to internal memory, data cards and the RS232 port is critical as to how the data is stored. Printing to any of these locations will send the data as an ASCII file, that can be read by other computers etc. Saving to these locations will send the data as a binary file that can only be re-read by the 6500 or 6505 spectrophotometers.

For details of the filing system and results or method storage and manipulation see Section 3.1, pages 20 to 24 of the Instruction Manual.

Section 7

Diagnostics

- 7.01 The Diagnostics Menu
- 7.02 Linearised Voltage
- 7.03 Channel Outputs
- 7.04 Shutter and Filters
- 7.05 Lamp Control
- 7.06 Motor Position Sensor
- 7.07 Wavelength Functions
- 7.08 Beam splitter Functions
- 7.09 Zero Order Cal.
- 7.10 Calibrate Functions

7.01 The Diagnostics Menu

The Diagnostics menu is accessed using the following Special Key function, hold down the right arrow key $\langle \rangle$ while turning the power on. Do not make any changes to the settings in this menu unless trained to the requirements set out in Section 1.2 of this manual. Similarly do not use any test or calibration equipment that does not meet the requirements set out in Section 1.4 of this manual.

7.02 Linearised Voltage

This is the signal from the detector at SK2 pin 4 and is directly proportional to the level of light falling on the detector. This value is very useful in determining the light energy levels under different operating conditions. As there is no smoothing this value may be seen to vary at times.

7.03 Channel Outputs

The signal is amplified to three different levels, with a factor of 10 between each (i.e. 1, 10 and 100 times gain). Each of these amplified signals then pass into the first three channels (CH0 to CH2) of an 8 channel, 12 bit, serial, A to D converter.

All three channels are converted and the microprocessor selects the channel that gives the best resolution without reaching saturation (32767 counts) for manipulation and display in the operating mode. In the Diagnostics mode all three channels can be viewed enabling further judgement to be made on energy levels and calibration accuracy.

Channels 3 and 4 (CH3 and CH4) are generated in a similar manner from the Beam Splitter Signal. The higher gain of channel 4 will be automatically selected if the wavelength is less than 450nm but greater than 265nm.

7.04 Shutter and Filters

Pressing numeric keys in the Diagnostics menu will initiate specific functions. The first three of these effect the shutter and filter solenoids.

Pressing the number one <1> key toggles the dark shutter between its open and closed states. The 'open' state is when the shutter is out of the light path, the 'closed' state is when it is in the light path.

Pressing the number two <2> key toggles the IR Stray Light Filter between its open and closed states. The 'open' state is when the filter is out of the light path, the 'closed' state is when it is in the light path.

Pressing the number three <3> key toggles the UV Second Order Stray Light Filter between its open and closed states. The 'open' state is when the filter is out of the light path, the 'closed' state is when it is in the light path.

The shutter and filter controls can be used in conjunction with the linearised Voltage and Channel Outputs to determine optical energy levels under various conditions, as described in Section 2.4 Signal Levels.

7.05 Lamp Control

The Diagnostics menu gives some control over both the visible and UV light sources.

Pressing the number four <4> key toggles the visible (tungsten) lamp between its normal 12V intensity and the dimmed 5V level. The selected voltage is shown against the menu option 'Lamp Voltage'.

Pressing the number five <5> key toggles the UV (Deuterium) lamp on and off. When on (enabled) 'yes' is shown against the menu option 'UV Lamp Enabled', when off 'no' is shown.

7.06 Motor Position Sensor

The status of the opto-coupler that is triggered when the grating reaches the end of its travel is shown in the Diagnostics Menu as 'Motor Position Sensor'.

When this option shows 'clear' then the grating has not yet reached the end of its travel, when it shows 'blocked' then the grating has reached the end of its travel and the opto-coupler has been triggered by the sensor vane.

7.07 Wavelength Functions

In the Diagnostics Mode pressing the 'GoTo' key causes exactly the same reaction as it would do in normal operation, that is a dialogue box is displayed for entering the wavelength that is required. Extra care must be taken however as the full range of values that will drive the grating from -50nm to 1250nm is now available.

Pressing the number seven <7> key displays a dialogue box for entering a Wavelength Offset. This value is in tenths of a nanometre, (i.e. 25 = 2.5nm). The maximum range is +/- 30 (+/- 3.0nm). Careful adjustment of this value is the preferred method for adjusting wavelength accuracy in the field, see Section 8.3 Wavelength Calibration. NOTE: - Changes to this value are not effective until the instrument is Re-Booted and has successfully completed a Start Up Routine.

7.08 Beam Splitter Functions

Pressing the number eight <8> key displays a dialogue box for entering a value for the Beam Splitter Offset. This value should reduce the Beam Splitter Dark Current to zero. With the Beam Splitter Detector under dark conditions this value should set CH3 or CH4 to zero.

Pressing the number nine <9> key displays a dialogue box for entering a value for the Beam splitter factor. This is a factor (in tenths) for matching the gain of the Beam Splitter detector to the Signal Detector. This will normally be around 10 giving a gain of unity. If set to zero it will effectively turn off the Beam splitter and the instrument will mimic a single beam system.

7.09 Zero Order Calibration

Pressing the Calibrate key in the Diagnostics Mode enables a manual zero order calibration to be set. Entering the Diagnostics Mode bypasses the Start Up Routine so no automatic zero order calibration has been carried out, although the settings from the previous operation will still be retained. However if a fault condition relating to wavelength accuracy exist it may be necessary to manually set the zero order point using this function before other settings are adjusted.

It should be possible to set this in most cases by pressing the GoTo key and then '0'. Then by using the up and down arrow keys while checking for the presence of white light passing through the sample compartment. Pressing the Calibrate key for a second time when the maximum white light is visible will set the zero order reference point. If it is impossible to find any white light within $\pm 10\text{nm}$ of the 'GoTo 0' point then it will be necessary to open the monochromator and trace the light beam between the various components to check for any miss-alignment.

This procedure will not give the same accuracy as when the zero order point is set automatically during the start up routine. Any setting entered manually in this way will be overridden during the next completed Start Up Tests.

7.10 Calibrate Functions

Pressing the Print Key in the Diagnostics Mode will display a series of prompts for different input voltages to set and store calibration data for the A to D converter. This data is stored in the E²PROM on the Detector PCB. Do not enter this command without the correct, certified, equipment and leads available. Only personnel with specific training on these products should make this adjustment.

Pressing the sign $\langle +/ - \rangle$ key in the Diagnostics Mode will display a series of values for output voltages that enable the analogue output to be set. These settings are stored in the E²PROM on the Power Supply PCB.

Section 8

Maintenance

- 8.1 Routine Maintenance
- 8.2 Dismantling
- 8.3 Energy Levels
- 8.4 Wavelength Calibration
- 8.5 Beam Splitter Calibration
- 8.6 A to D Calibration
- 8.7 D to A Calibration
- 8.8 Performance Verification

8.1 Routine Maintenance

The Jenway Limited, Model 6500 and 6505 have been designed to give optimum performance with minimal maintenance. It is only essential to keep the external surfaces clean and free from dust and to ensure that the area around and underneath the unit is also clean and dust free.

The sample area should be kept clean and accidental spillage should be wiped away immediately as some corrosive or solvent based samples or standards may attack the materials used in the sample chamber and cell holders.

To give added protection when not in use the unit should be disconnected from the mains supply and covered with the optional dust cover (640 133). For longer term storage or re-shipment, it is recommended that the unit be returned to the original packing case.

Details of all routine maintenance tasks, including changing the lamps can be found in Section 4 of the Instruction Manual.

8.2 Dismantling

Do not attempt to dismantle these units unless they are in a clean, dry and dust free environment.

Use a soft lint free cover on any benches that will have casework, displays or keypads placed on them.

Use approved and tested anti-static procedures when dismantling any electronic sub-assembly or PCB and store these items in anti-static containers where necessary.

General – Access to all major sub-assemblies can easily be gained by removing the top half of the case. Access to the lamp housing can be made through the lamp access panel on the rear of the unit. The sampling accessory and its relevant driver PCB can be accessed by removing the sample chamber lid assembly.

Top/Bottom Case Assemblies – The top and bottom case assemblies can easily be separated by unscrewing the four recessed screws in each corner of the base. This should be done without

inverting the unit, by moving it forward over the front edge of the bench to unscrew the front two screws, and then turning it around to do the same with the back two. While it is turned round the top two screws that hold the lamp access panel in place should be removed. Turn it back round and then the top half of the case can be lifted off the bottom half, take care that the sample chamber rear wall and back panel are not lifted out of their slots as the top is raised. Turn the top through 90 degrees and rest it on its back edge to the left-hand-side of the unit.

Should it be necessary to work on the top case assembly by itself it is simply a matter of disconnecting the plug from SK4 on the power supply PCB and the plug that goes to the mouse driver PCB then the top can be completely removed.

Microprocessor/Display PCB The microprocessor/display PCB is mounted in the top case assembly. To remove it disconnect PL3 to the internal printer, PL2 to the power supply PCB, PL5 to the mouse PCB and PL4 to the membrane keypad. Unscrew the four outer screws and the two boards can be removed. The display module can be separated from the microprocessor PCB by unplugging PL6 and unscrewing the other four screws (nuts on some versions) that hold the two together. When reassembling ensure that the membrane keypad strip connector passes through the slot in the PCB.

Deuterium Lamp Supply PCB The Deuterium Lamp Supply PCB is mounted in the lower case assembly and plugs (at 90 degrees) into the Power Supply PCB. To remove it unscrew the two screws that hold the right hand bracket into the base. Lift the bracket clear of the two earth wires and put to one side with the screws. Carefully unplug the Deuterium Lamp Supply PCB from the Power Supply PCB. To completely remove it from the instrument, unplug the Deuterium lamp and pull the connector through the moulded channel. When replacing make sure the pins on the connector to the Power Supply PCB are correctly aligned and that the PCB is correctly located in the grove in the case.

Power Supply/Mouse Driver PCBs

Disconnect the large multi-pin connector to the transformer, PL6, then the four smaller connectors on the lower front side of the PCB, PL1, PL3, PL12 and PL5, then remove PL7 from the top of

Replacement is the reverse of dismantling, but ensure a full calibration is run so that the new calibration data is stored on the Detector PCB.

Sampling Accessory/Driver PCB The sampling accessory and its driver PCB can be accessed without removing the top half of the case. The mechanical part of the accessory can often be fitted by simply opening the sample cover, however for more complex arrangements or where a replacement driver PCB has to be fitted access can be gained by removing the complete sample chamber cover. To do this turn the instrument around and remove the two countersunk screws in the back of the grey moulding that is the fixed part of the sample chamber cover. Lift the sample chamber lid and remove the single screw at the front of the same moulding, do not touch the two screws in the black hinge block. This will enable the complete sample chamber cover to be removed.

Multi-Cell Changer Assembly This sampling accessory is fitted as standard and is easily removed by unscrewing the four fixing screws in the black base plate. It is safe to move the cell carriage by hand if it is covering any of the screws as it will automatically re-align on power up. Disconnect PL2 from the accessory Driver PCB and raise the sample chamber back plate to pass the cable and connector under the cut out in the bottom right hand corner. The mechanical assembly can now be removed. Replacement is the reverse of dismantling but take extra care to ensure that the cable is under the cut out and is not crushed under the bottom edge of the sample chamber back plate.

Accessory Driver PCB This PCB is mounted behind the sample chamber and next to the lamp housing. It holds calibration data for the multi-cell changer positioning stepper motor so the mechanical assembly and this PCB must be treated as a matched pair.

Removal is by unscrewing the four fixing screws and lifting out of the rear chamber area. Certain accessories are fitted with cables that have to pass under the PCB and out through the cut out in the rear panel. Always ensure these cables are clear of the fixings so that the wires do not get trapped.

8.3 Energy Levels

Equipment Required; - None, checked against internal settings.

Before proceeding with any calibration it is essential to ensure the correct functioning of the optical system, this can be done very easily in the Diagnostics Menu (see Section 7) where the following performance should be obtained.

U V Energy, Set wavelength to 190nm, Dark Shutter open, IR stray light filter closed, UV stray light filter open; Linearised voltage must be greater than 20mV.

Visible Energy, Set wavelength to 700nm, Dark Shutter open, IR stray light filter open, UV second order stray light filter closed; Linearised Voltage must be greater than 1000mV and less than 3400mV.

Dark Current, Set wavelength to 320nm, Dark Shutter closed, IR stray light filter closed, UV second order stray light filter open; Linearised Voltage should be zero +/- 6mV.

320nm Output, Set wavelength to 320nm, UV lamp off, Dark Shutter open, IR stray light filter closed, UV second order stray light filter open; Linearised voltage must be greater than 17mV. Typical values for units fitted with the Richardson grating (Serial Numbers greater than 2000) are 40mV, for those fitted with the American Holographics grating (Serial Numbers less than 2000) typical values will be 17 to 20mV.

Beam Splitter Dark Current, Set wavelength to 320nm, UV lamp off, Dark Shutter closed, IR stray light filter closed, UV second order stray light filter open; CH4 should be zero +/- 100 counts.

Beam Splitter Output, Set wavelength to 320nm, UV lamp off, Dark Shutter open, IR stray light filter closed, UV second order stray light filter open; CH4 should be greater than 250 counts but less than 1000.

8.4 Wavelength Calibration

Equipment Required; - A certified wavelength standard, i.e. Holmium Oxide Filter, Holmium Perchlorate Solution etc.

Wavelength calibration can be carried out in the Diagnostics Mode using the wavelength offset function. Do not carry out the following procedure without a suitable, certified wavelength calibration standard.

Turn the unit on and allow the Start Up tests to complete.

Select the Spectrum Mode from the Main Menu.

Set up a scan of the certified wavelength calibration standard using a resolution of 0.2nm over the minimum wavelength range needed to isolate the peak of interest. Carry out a Baseline scan using these settings, and then scan the wavelength calibration standard.

In the Post Scan Analysis menu set Spectral Smoothing to 'OFF', Noise Filter to 'None' and Turning point labelling to 'Enabled'.

Record the wavelength of the peak of interest.

Repeat the above and check that the same value is reported.

Calculate the adjustment required to correctly align the reported figure with the certified value.

Certified Value – Reported Value = Correction factor (can be negative or positive, maximum correction permissible is 3.0nm)

Switch the unit off and re-start it in the Diagnostics Mode by holding down the right hand arrow key <> while turning power on.

Make a note of the value in the Wavelength Offset option, including whether negative or positive.

Press the number seven <7> key to display the Wavelength Offset dialogue box

Enter a new number calculated from; (Correction Factor x 10) + existing value.

8.7 D to A Calibration

Equipment required; - Voltmeter capable of reading 2.0V with a resolution of 1mV.

The D to A calibration sets the levels of the analogue output. This is carried out with the on-board voltage reference at zero and +/- 2000mV.

Select the Diagnostics menu by turning the unit on with the right hand <>> arrow key depressed.

Press the Sign <+/-> Key to activate the Calibrate DAC menu option.

The menu line will change to prompt for specific input levels and show the relevant channel output counts.

Connect a voltmeter to the analogue output on the rear panel. Select a range that will display 2000mv to 0.1mV resolution.

The first prompt indicates an output level of -2000mV, use the up and down and left and right arrow keys to adjust the actual reading on the voltmeter to -2000mV.

The left and right arrow keys change the output in 5mV steps, the up and down arrow keys in 0.5mV steps.

When the correct level is reached press the enter key and the prompt moves on to 0mV, repeat the above for this and the 2000mV levels.

When successfully completed the Calibrate DAC menu option returns to its original state.

8.8 Performance Verification

Equipment Required; - 1. Certified Wavelength Standard, 2. Certified Absorbance Standards, 3. Certified Stray Light Standard.

Items 1 and 2 above can be supplied as Calibration Filter Sets, order part numbers 035 088 for the 6500 or 035 091 for the 6505.

Where filters are not available the following reagents may be used:

8.8.1 Wavelength Standard

Holmium Perchlorate – 5% w/v solution of Holmium Oxide in 1.4N Perchloric acid, this will give absorbance maxima at 241.0, 278.1, 287.0, 361.4, 416.1, 451.1, 485.3, 536.5 and 640.5nm.

8.8.2 Absorbance Standard

Potassium Dichromate – 100.0mg/l in 0.005M Sulphuric Acid (use the Sulphuric Acid as the blank). This will give Absorbance values of 1.071 at 350nm, 0.484 at 313nm, 1.444 at 257nm, 1.242 at 235. Potassium Dichromate – 50.0mg/l in 0.005M Sulphuric Acid (use the Sulphuric Acid as the blank). This will give Absorbance values of 0.536 at 350nm, 0.242 at 313nm, 0.722 at 257nm, 0.621 at 235.

8.8.3 Stray Light Standard

Sodium Nitrate – 50g/l in deionised water, should give less than 0.1% transmittance at 340nm.

Sodium Iodide – 10g/l in deionised water, should give less than 0.1% transmittance at 220nm.

WARNING

All these solutions are hazardous and the manufacturer/suppliers safety precautions should be carefully followed at all times in preparation, use and storage.

8.8.4 Wavelength Verification

Equipment Required; - A certified wavelength standard, i.e. Holmium Oxide Filter, Holmium Perchlorate Solution etc. (See Section 8.8.1)

Turn the unit on and allow the Start Up tests to complete then allow 15 minutes for the instrument to warm up.

Select the Spectrum Mode from the Main Menu.

Set up a scan of the certified wavelength calibration standard or Holmium Perchlorate solution using a resolution of 0.2nm over the minimum wavelength range needed to isolate the peaks of interest. Adjust the Noise Filter or Smoothing and the resolution to give clean peaks without any interfering spikes.

Carry out a Baseline scan using these settings, and then scan the wavelength calibration standard or Holmium Perchlorate solution.

Use the table of peaks or the cursor to check that the wavelengths of the peaks of interest fall within the specified tolerance of the instrument PLUS the tolerance of the filter/reagent used.

8.8.5 Absorbance Verification

Equipment Required; - Certified Standard Absorbance Filters or Potassium Dichromate solution. (See Section 8.8.2)

Turn the unit on and allow the Start Up tests to complete then allow 15 minutes for the instrument to warm up.

Select the Photometrics Mode from the Main Menu.

Select a wavelength at which the filter or solution is certified.

For the Potassium Dichromate solution use the Sulphuric Acid solution as a blank, (See Section 8.7.2) if the filter set includes a zero filter use this as the blank, if not set the blank (zero absorbance or 100% transmittance) with an empty sample chamber.

Insert the certified filter or Potassium Dichromate solution and check that the reading is within the specified tolerance of the instrument PLUS the tolerance of the filter/solution used.

Repeat this for other filters or solutions and at other specified wavelengths as necessary.

8.8.6 Stray Light Verification

Equipment Required; - Certified Stray Light Filters or Sodium Nitrate Solution or Sodium Iodide Solution. (See Section 8.8.3)

Turn the unit on and allow the Start Up tests to complete then allow 15 minutes for the instrument to warm up.

Select the Photometrics Mode from the Main Menu.

Select a wavelength at which the filter or solution is certified (340nm for Sodium Nitrate or 220nm for Sodium Iodide).

Set 100% transmittance with a quartz cuvette filled with the deionised water used to make up the solutions or with the blank filter supplied by the manufacturer.

Insert the stray light filter or solutions, as above, and ensure that the reading is within the specified tolerance of the instrument PLUS the tolerance of the filter/solution used.

Section 9

Circuit Diagrams

- 9.10 Power Supply Schematic 640 008 (3pgs)
- 9.11 Power Supply Layout 640 008 (1pg)

- 9.20 Deuterium Lamp Supply Schematic 640 506 (2pgs)
- 9.21 Deuterium Lamp Supply Layout 640 506 (1pg)

- 9.30 Detector PCB Schematic 650 505 (1pg)
- 9.31 Detector PCB Layout 650 505 (1pg)
- 9.32 Beam Splitter PCB Schematic 650 010 (1pg)
- 9.33 Beam Splitter PCB Layout 650 010 (1pg)

- 9.40 Microprocessor PCB Schematic 650 006 (6pgs)
- 9.41 Microprocessor PCB Layout 650 006 (1pg)

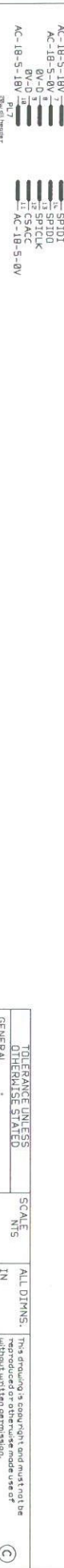
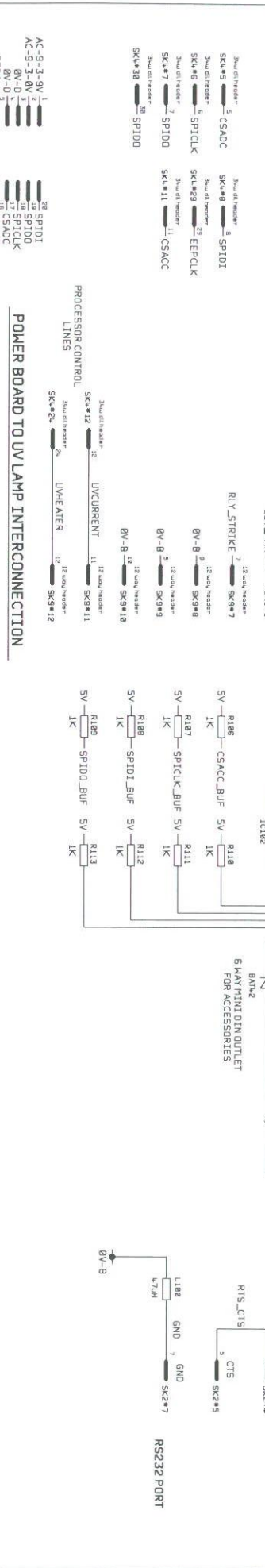
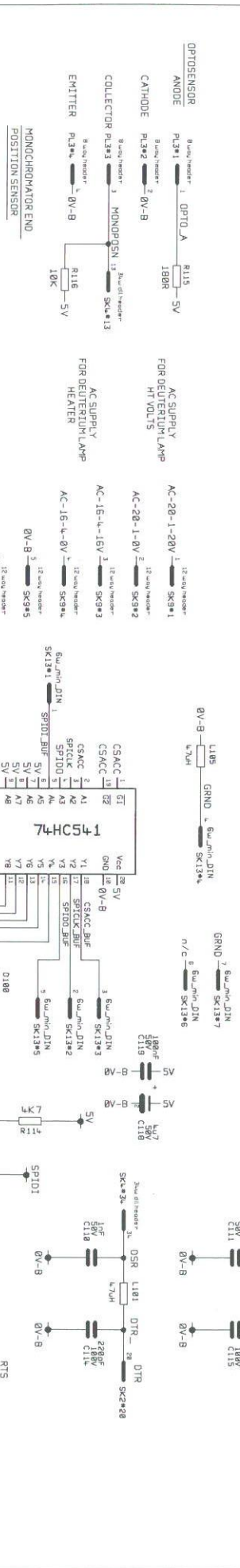
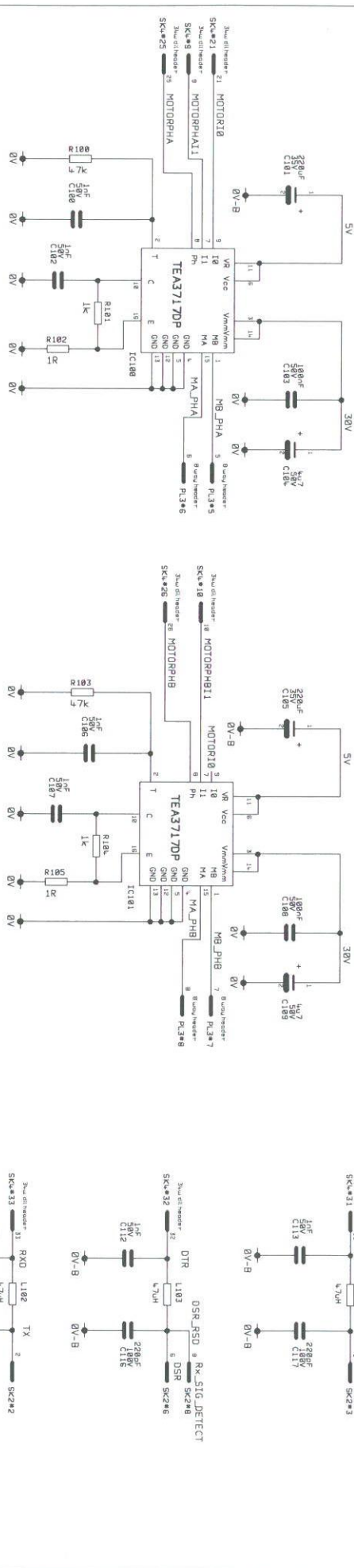
- 9.50 Mouse & Parallel Port Schematic 650 012 (1pg)
- 9.51 Mouse & Parallel Port Layout 650 012 (1pg)

- 9.60 Accessory Driver PCB Schematic 642 003 (1pg)
- 9.61 Accessory driver PCB Layout 642 003 (1pg)

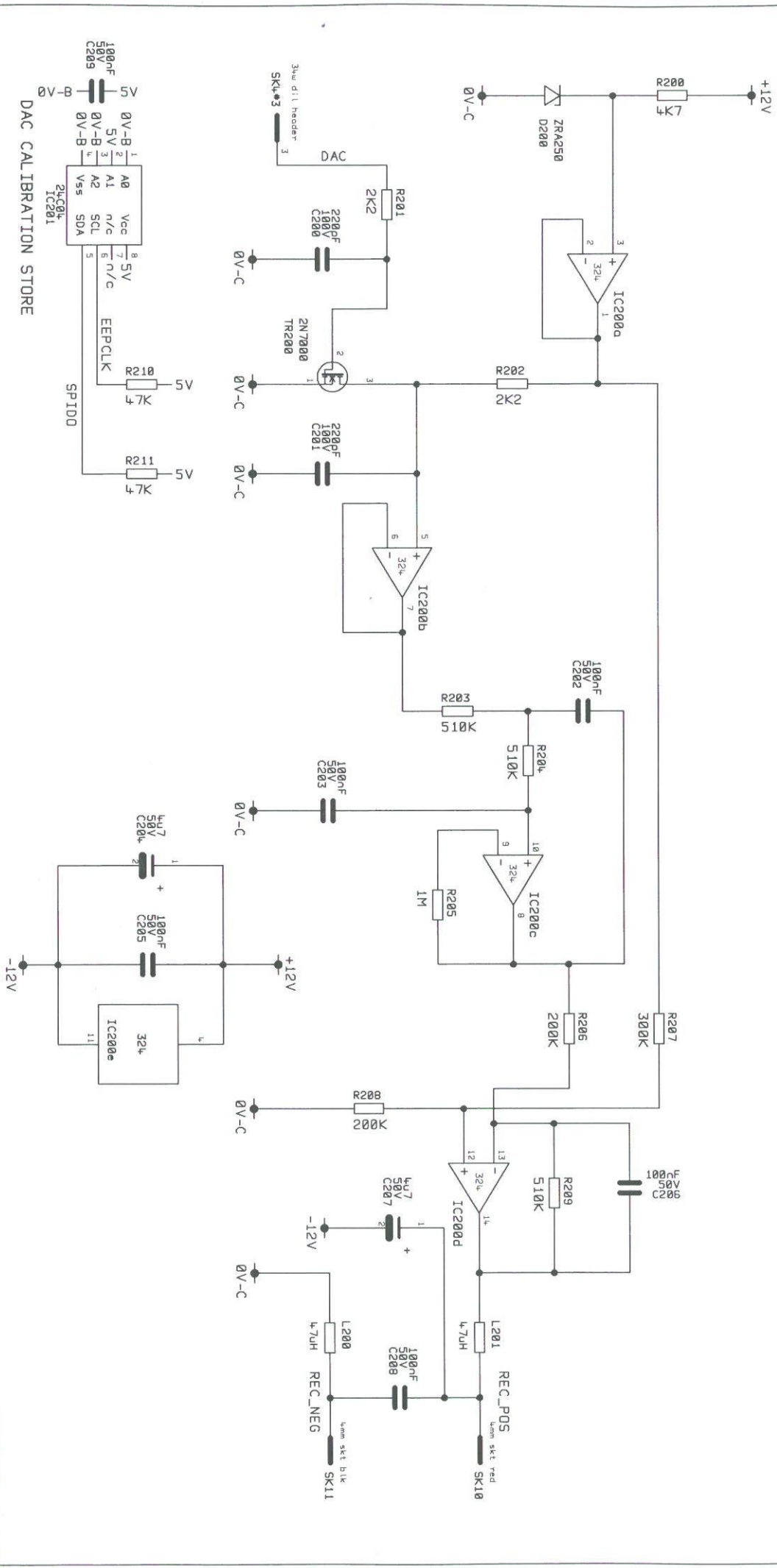
Section 9

Circuit Diagrams

- 9.10 Power Supply Schematic - 640 008 – 3 pages
- 9.11 Power Supply Layout – 640 008 – 1 page

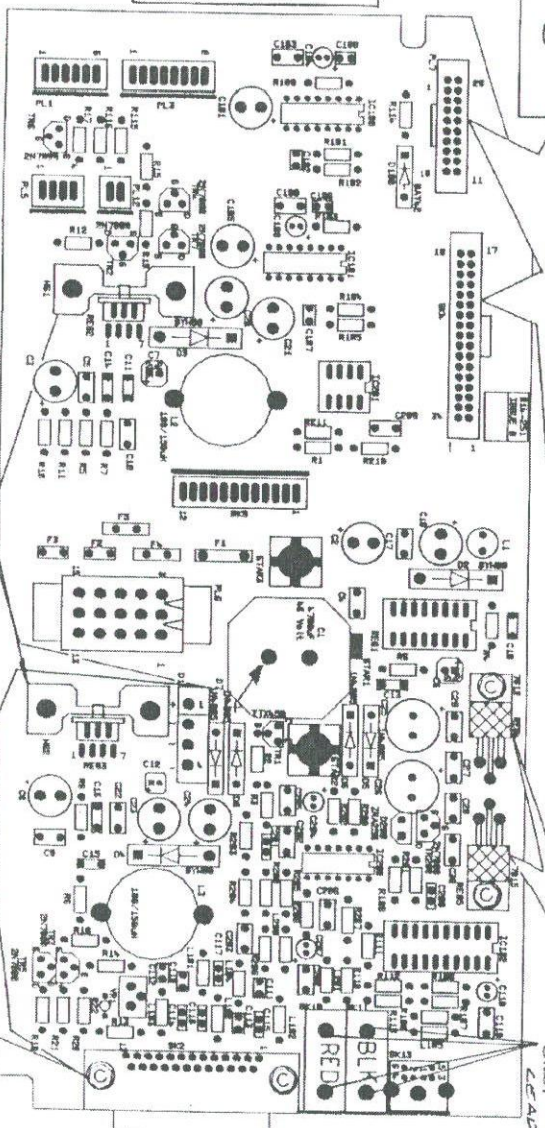
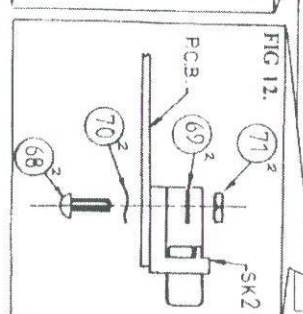
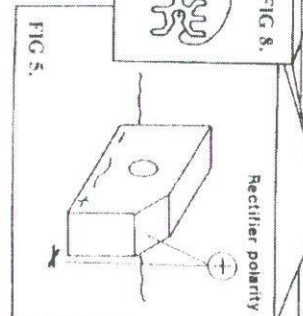
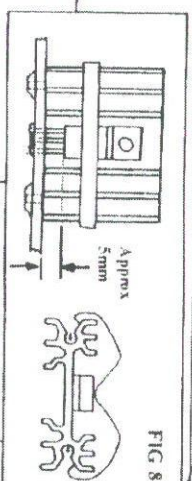
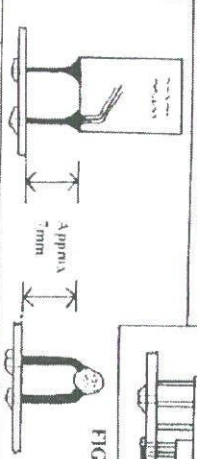
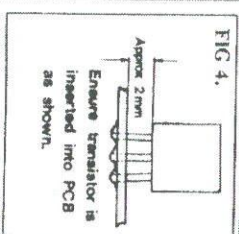
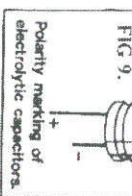
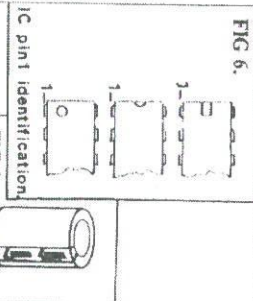
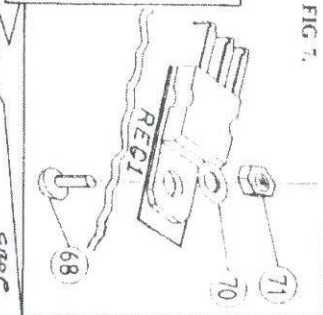
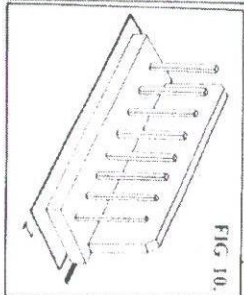
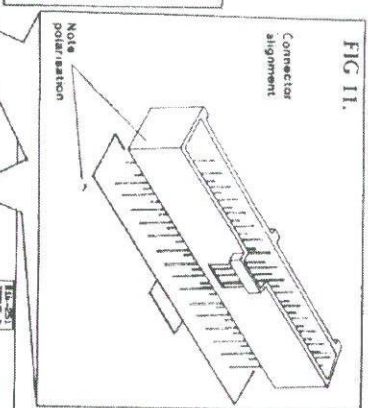
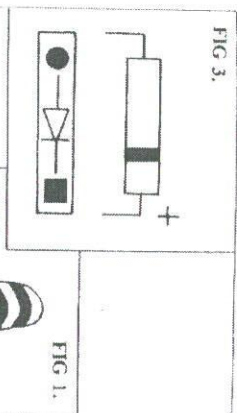


DETECTOR & ACCESSORIES INTERFACE			
AC-9-3-9V 1	AC-9-3-9V 2	AC-9-3-9V 3	AC-9-3-9V 4
AC-9-3-9V 5	AC-9-3-9V 6	AC-9-3-9V 7	AC-9-3-9V 8
AC-9-3-9V 9	AC-9-3-9V 10	AC-9-3-9V 11	AC-9-3-9V 12
AC-9-3-9V 13	AC-9-3-9V 14	AC-9-3-9V 15	AC-9-3-9V 16
AC-9-3-9V 17	AC-9-3-9V 18	AC-9-3-9V 19	AC-9-3-9V 20
AC-9-3-9V 21	AC-9-3-9V 22	AC-9-3-9V 23	AC-9-3-9V 24
AC-9-3-9V 25	AC-9-3-9V 26	AC-9-3-9V 27	AC-9-3-9V 28
AC-9-3-9V 29	AC-9-3-9V 30	AC-9-3-9V 31	AC-9-3-9V 32
AC-9-3-9V 33	AC-9-3-9V 34	AC-9-3-9V 35	AC-9-3-9V 36
AC-9-3-9V 37	AC-9-3-9V 38	AC-9-3-9V 39	AC-9-3-9V 40
AC-9-3-9V 41	AC-9-3-9V 42	AC-9-3-9V 43	AC-9-3-9V 44
AC-9-3-9V 45	AC-9-3-9V 46	AC-9-3-9V 47	AC-9-3-9V 48
AC-9-3-9V 49	AC-9-3-9V 50	AC-9-3-9V 51	AC-9-3-9V 52
AC-9-3-9V 53	AC-9-3-9V 54	AC-9-3-9V 55	AC-9-3-9V 56
AC-9-3-9V 57	AC-9-3-9V 58	AC-9-3-9V 59	AC-9-3-9V 60
AC-9-3-9V 61	AC-9-3-9V 62	AC-9-3-9V 63	AC-9-3-9V 64
AC-9-3-9V 65	AC-9-3-9V 66	AC-9-3-9V 67	AC-9-3-9V 68
AC-9-3-9V 69	AC-9-3-9V 70	AC-9-3-9V 71	AC-9-3-9V 72
AC-9-3-9V 73	AC-9-3-9V 74	AC-9-3-9V 75	AC-9-3-9V 76
AC-9-3-9V 77	AC-9-3-9V 78	AC-9-3-9V 79	AC-9-3-9V 80
AC-9-3-9V 81	AC-9-3-9V 82	AC-9-3-9V 83	AC-9-3-9V 84
AC-9-3-9V 85	AC-9-3-9V 86	AC-9-3-9V 87	AC-9-3-9V 88
AC-9-3-9V 89	AC-9-3-9V 90	AC-9-3-9V 91	AC-9-3-9V 92
AC-9-3-9V 93	AC-9-3-9V 94	AC-9-3-9V 95	AC-9-3-9V 96
AC-9-3-9V 97	AC-9-3-9V 98	AC-9-3-9V 99	AC-9-3-9V 100



DAC CALIBRATION STORE

P1	15/4/97	dph	A	CN2139	1/9/97	E			DATE	APP'D	DATE 10/MAR/97	DRN. DPH	DRG. REF. 640 008	SHT. 3 OF 3
P2			B	CN2146	18/1/97	F			This drawing is copyright and must not be reproduced or otherwise used without written permission.					
P3			C	CN2154	12/2/97	G			JENWAY LTD.					
P4			D			H			Gransmore Green, Felsted, Dunmow, Essex. CM6 3LB					
									Tel: 01371 820122					
													6400/5 MAIN POWER SUPPLY	SCHEMATIC



- CAUTION.** Assemble using static precautions. Place completed PCB into bag provided. These devices are static sensitive.

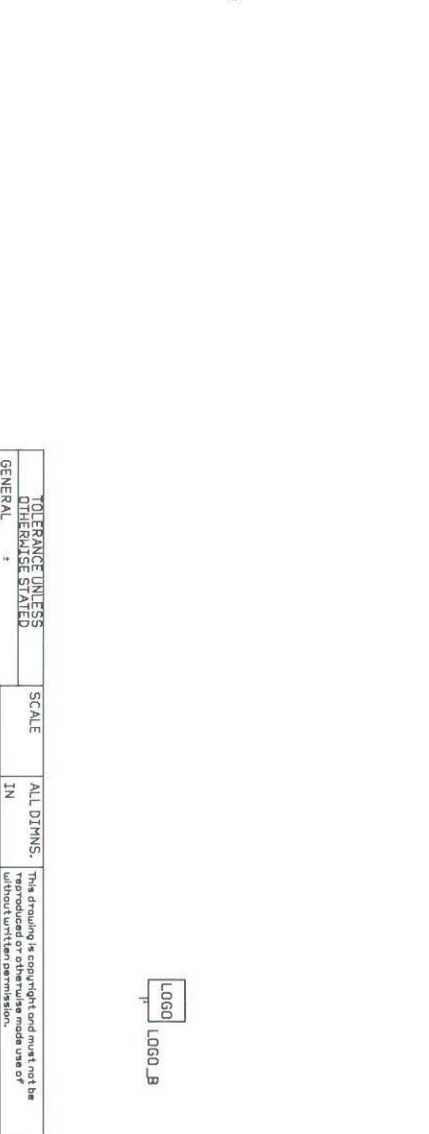
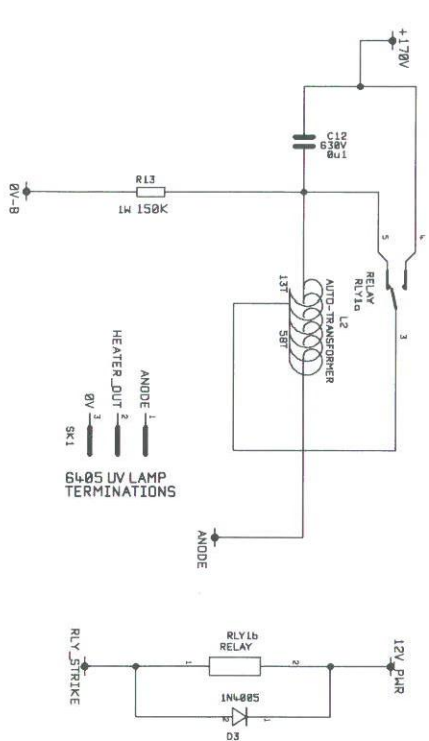
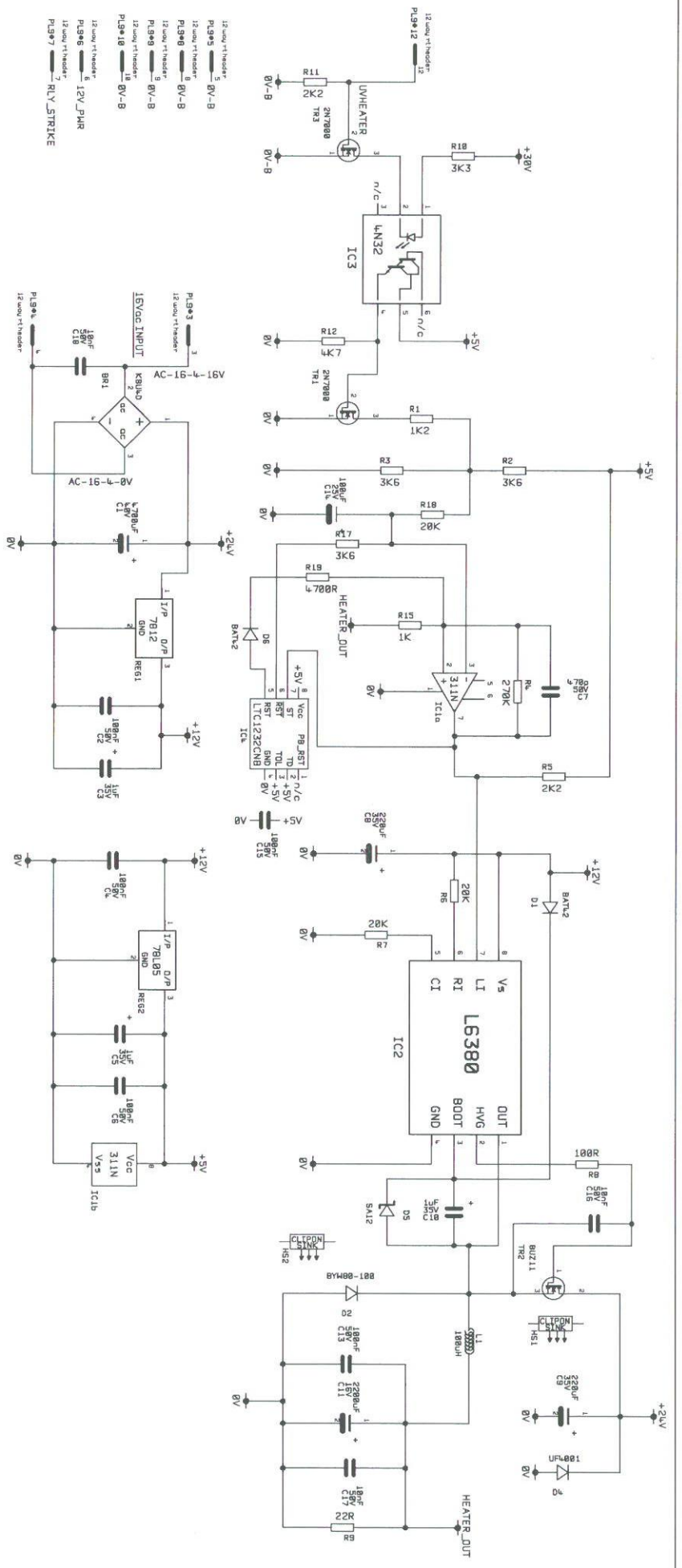
ASSEMBLY NOTES

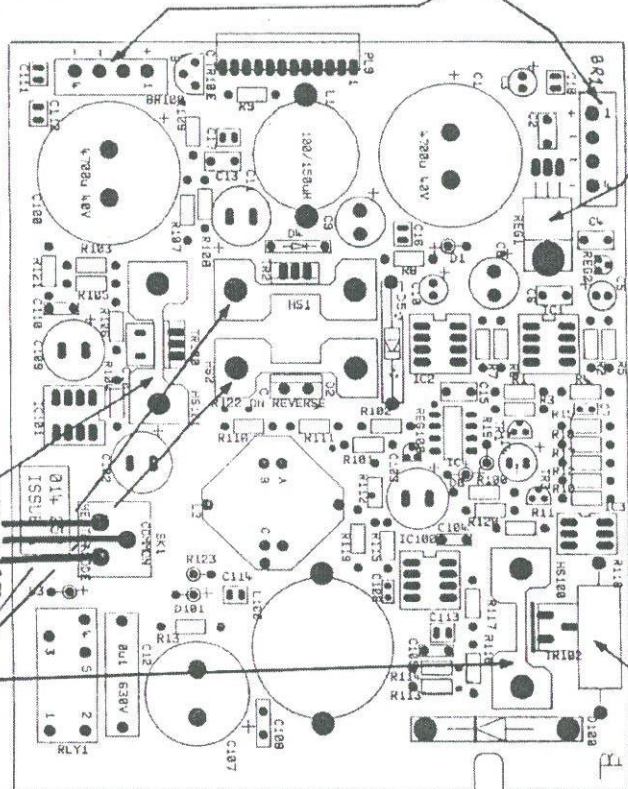
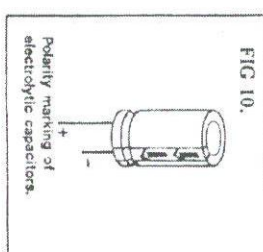
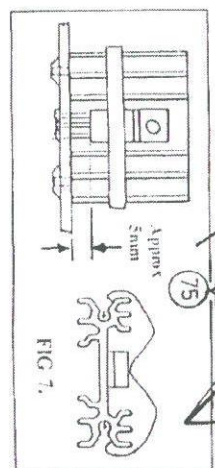
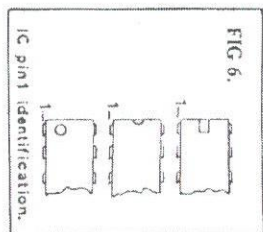
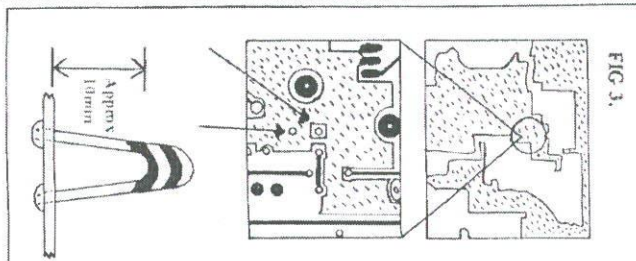
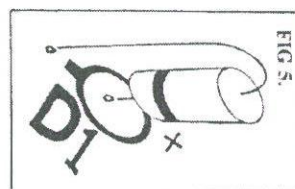
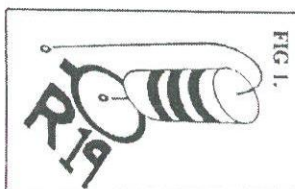
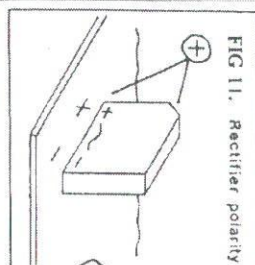
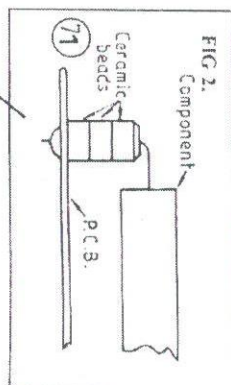
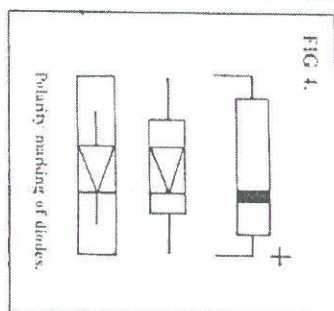
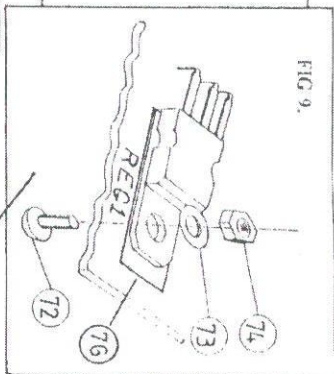
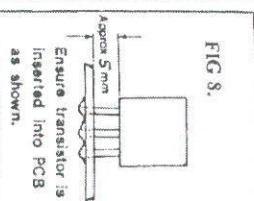
- 1) Fit resistors R1 through R21, R100 through R116 and R200 through R211 in positions shown. Trim leads to length and solder.
- 2) Fit Inductors L1, L2 through L105, L200 and L201. Trim leads to length and solder.
- 3) Referring to FIG 1, fit R22. Trim leads to length and solder.
- 4) Referring to FIG 2, fit Resecurable fuses F1 through F5. Trim leads to length and solder.
- 5) Referring to FIG 3, fit Diodes D2 through D6 and D100 in positions shown. Trim leads to length and solder. Ensure polarity is observed.
- 6) Referring to FIG 4, fit Diode D200. Trim leads to length and solder.
- 7) Referring to FIG 5, fit Bridge Rectifier D1 in position shown. Trim leads to length and solder. Ensure polarity is observed.
- 8) Referring to FIG 6, fit integrated circuits (ICs) IC100, IC101, IC102, IC200, IC201 and REG1. Solder all pins.
- 9) Referring to FIG 7, fit Regulators REG 4, 5. Trim leads to length, solder and secure regulator to PCB as shown.
- 10) Referring to FIG 8, fit Regulators REG 2, 3. Apply a smear of heat sink compound (item 65) to mating surface of each regulator. Fit heat sink (item 54) and solder both legs. Push heat sink retaining clip (item 55) in to place.
- 11) Referring FIG 4, fit TR1 through TR7 and TR200. Trim leads to length and solder.
- 12) Fit Capacitors C4, C5, C9, C10, C11, C13, C14, C15, C16, C17, C18, C22, C27, C28, C29, C30, C100, C102, C103, C106, C107, C108, C110 through C137, C119, C200, C201, C202, C203, C205, C206, C208, C209. Trim leads to length and solder.
- 13) Referring Fig 9, fit Capacitors C1, C2, C3, C6, C7, C8, C12, C19, C20, C21, C23, C24, C25, C26, C101, C104, C105, C109, C118, C204. Trim leads to length and solder. Ensure polarity is observed.
- 14) Fit Inductors L1, L2 and L3. Trim leads to length and solder.
- 15) Fit Variable Resistor VR1. Trim leads to length and solder.
- 16) Referring to FIG 10, fit module connectors PL1, PL3, PL5, PL12 and socket SK1. Ensure polarity is observed.
- 17) Referring to FIG 11, fit DIL connectors PL7 and SK4.
- 18) Referring to FIG 12, fit 25 way D type Connector SK2 as shown and secure with lugs provided. Solder all pins.
- 19) Fit Red socket in position SK10 and Black socket in position SK11. *Check PCB*.
- 20) Fit Mini Dia. connector in position SK13. Solder all pins.
- 21) Fit 15 Terminals (item 42) in Plug Housing (item 41) and fit complete assembly to PCB in position SK3. Solder all pins. *Ensure polarity is observed.*
- 22) Inspect PCB to ensure all components have been correctly and neatly fitted. Ensure all joints are soldered neatly without shorts and that all frangs are tight. Place completed PCB in static safe bag and seal with standard label.

Section 9

Circuit Diagrams

- 9.20 Deuterium Lamp Supply Schematic – 640 506
– 2 pages
- 9.21 Deuterium Lamp Supply Layout - 640 506
– 1 page





- CAUTION** . Assemble using static precautions. Place completed PCB into bag provided. These devices are static sensitive.

ASSEMBLY NOTES

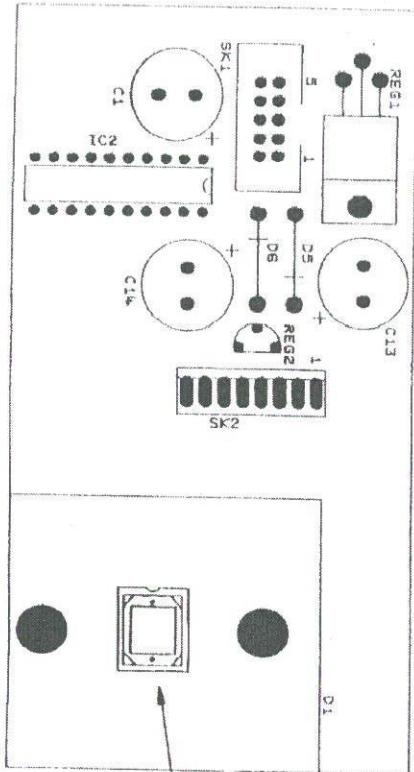
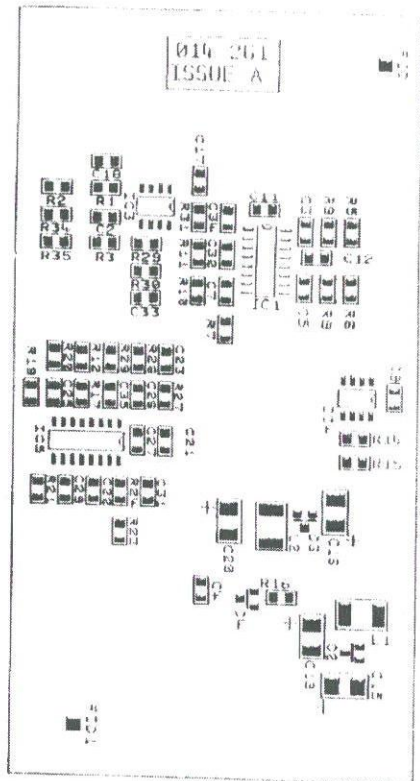
- 1) Fit Resistors R1 through R13, R15, R17, R18, R100 through R117, R119 through R121 and R123 in positions shown. Trim leads to length and solder.
- 2) Referring to FIG 1, fit Resistors R19 and R123 in position shown. Trim leads to length and solder.
- 3) Referring to FIG 2, fit R118 in position shown using ceramic beads at each end. Trim leads to length and solder.
- 4) Referring to FIG 3, fit R122 to the other side of PCB. Trim leads to length and solder.
- 5) Ensure R122 is not damaged by subsequent assembly operations. Referring to fit 4, fit Diodes D4, D5 and D100 in positions shown. Trim leads to length and solder. Ensure polarity is observed.
- 6) Referring to FIG 5, fit Diodes D1, D3, D6 and D101 in positions shown. Trim leads to length and solder. Ensure polarity is observed.
- 7) Referring to FIG 6, fit integrated circuits (IC's) IC1 through IC4, IC100 and IC101. Solder all pins.
- 8) Fit IC101. Trim leads to length and solder.
- 9) Fit Heatsink (item 51) in position HS100 and solder both legs. Apply a smear of Heat sink compound (item 50) to tab of TR102. Referring to FIG 7, fit TR102 to PCB ensuring tab is in contact with Heatsink over it's full length. Retain TR102 in position against Heatsink with clip (item 52). Solder TR102 in place and trim leads.
- 10) Fit TR100, TR2 and D21 in that order. All three are fitted in the same fashion as TR102 (note 9).
- 11) Referring to FIG 8, fit TR1, TR3, TR101, REG2 and REG100. Trim leads to length and solder.
- 12) Referring to FIG 9, fit REG1. Trim leads to length, solder and secure regulator to PCB as shown.
- 13) Fit Capacitors C2, C4, C6, C7, C12, C13, C15, C16, C17, C18, C104, C105, C106, C108, C110, C111, C112, C113, C114. Trim leads to length and solder.
- 14) Referring to FIG 10, fit Capacitors C3, C5, C10, C14, C102, C103, 107, C109. Trim leads to length and solder.
- 15) Ensure polarity is observed.
- 16) Fit L2, L100 and L1 in that order. Trim leads to length and solder.
- 17) Referring to FIG11, fit Capacitors C1, C8, C9, C11, C100. Trim leads to length and solder. Ensure polarity is observed.
- 18) Referring to FIG 12, fit Bridge Rectifiers BR1 and BR100 in positions shown. Trim leads to length and solder. Ensure polarity is observed.
- 19) Fit RLL.
- 20) Fit PL9.
- 21) Fit cable assembly (item 75) to SK1 as shown - Red to 'ANODE' Blue to 'HEATER' & 'COMMON'.
- 22) Inspect PCB to ensure all components have been correctly and neatly fitted. Ensure all joints are soldered neatly without shorts and that all fixings are tight. Place completed PCB in static safe bag and seal with standard label.

[illegible]

Section 9

Circuit Diagrams

- 9.30 Detector PCB Schematic – 650 505 – 1 page
- 9.31 Detector PCB Layout – 650 505 – 1 page
- 9.32 Beam Splitter Schematic – 650 010 – 1 page
- 9.33 Beam Splitter Layout – 650 010 – 1 page



NOTE

1. Please note D1 must be mounted flush to PCB.
2. Polarity of D1 is designated by an indent to the side of the package.
3. D1 is an optical component and must be clean and free from any marks.

ASSEMBLY NOTES 6505 DETECTOR PCB ASSEMBLY - 650-505

1. Referring to screening, reflow and feeder list information, complete all surface mount aspects of this assembly. (Job File Ref: 650-512).
2. Follow on screen instructions and perform MASCOT aspects of this assembly. (Job File Ref: 650-505).
3. Inspect PCB to ensure all aspects of the assembly have been satisfactorily completed. Test the assembly on A TB using assembly number 650505.

Screening:

Use stencil 977-261
Use Solder Paste RMA-AS90 (060-280)

Reflow:

Use Reflow Profile 002

Feeder List:

A	Unit Not Configured	E	Unit Not Configured
B00	Not Assigned	F00	001-436 100K
B01	010-023 10uH	F01	002-095 10uF
B02 thru B06	Not Assigned	F02	002-094 1uF
C00	001-380 47K	F03 thru F05	Not Assigned
C01	001-388 100K	F06	001-364 10K
C02 & C03	Not Assigned	F07	Not Assigned
C04	001-412 1M	F08	001-340 1K
C05	Not Assigned	F09	Not Assigned
C06	002-089 100nF	G00	001-397 240K
C07	002-090 1uF	G01	020-029
C08 & C09	Not Assigned	G02 & G03	Not Assigned
D00	Not Assigned	G04	002-099 100uF
D01	004-065	G05	Not Assigned
D02 thru D05	Not Assigned	G06	005-033 BAR43
D06	019-063	G07	001-437 100R
D07	019-063	G08	001-438 1K3
D08	004-067	G09	Not Assigned
D09	Not Assigned	H	Unit Not Configured

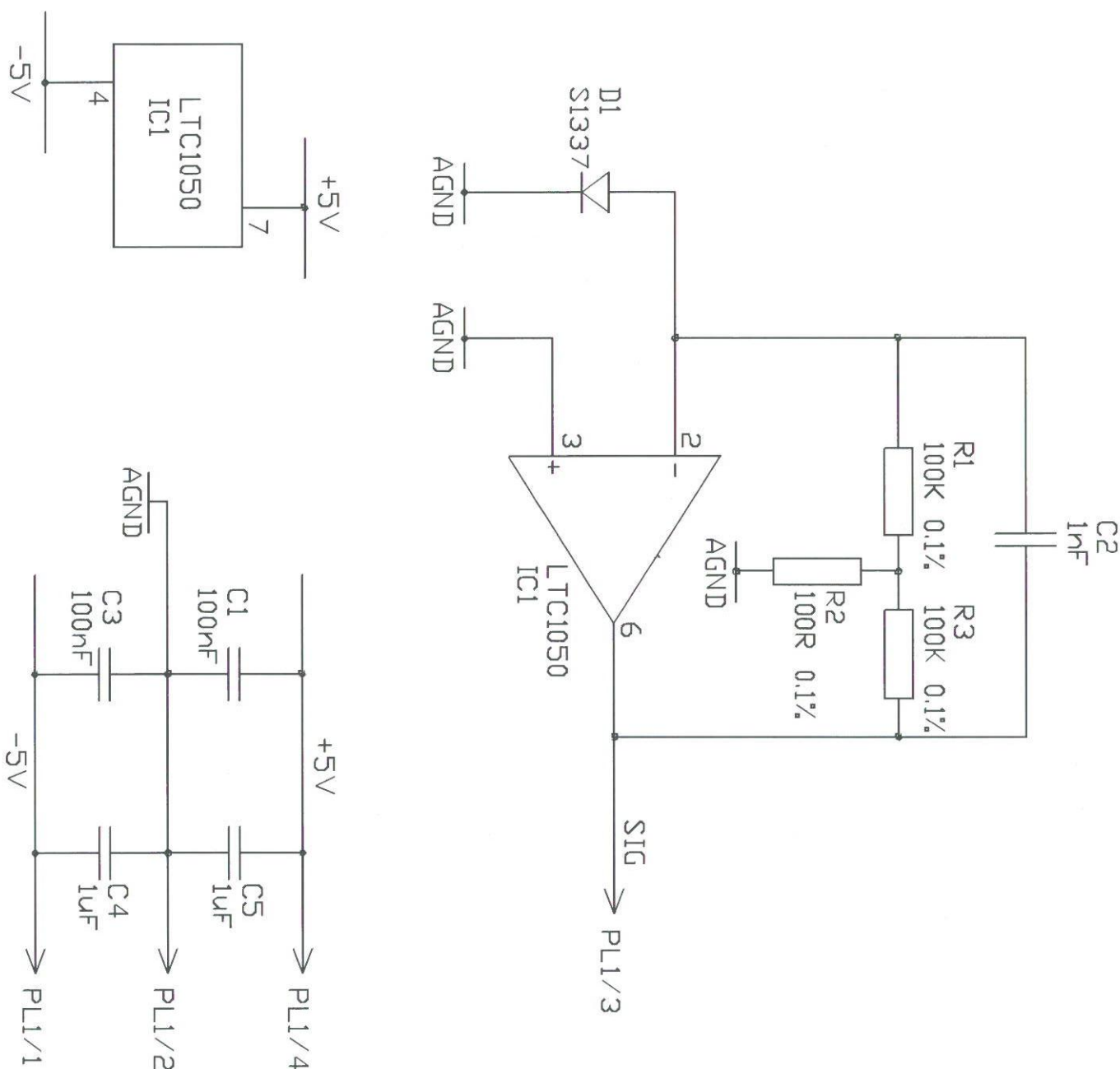
CAUTION:

Please remember that these devices are static sensitive. Handle and assemble using anti-static precautions at all times. Place completed PCB into anti-static bag provided.

A	CAN 3.5	E	1	IF IN COURT ASK
B	CAN 3.5	F	J	DO NOT SCALE
C	CAN 2.0	G	K	THIRD ANGLE
D	CAN 2.0	H	L	PROJECTION

TOLERANCES UNLESS OTHERWISE STATED		SCALE	ALL DIMS	THIS DRAWING IS TO BE USED AND MUST NOT BE REPRODUCED OR OTHERWISE MADE USE OF WITHOUT WRITTEN PERMISSION	
GENERAL	=	N			
HOLE DRS.	=				
DIMENSIONS	=				
ANGLES	=				
DATE 10-1-79		APPD CLO	DATE 10-1-79	DES. REF	650-505
JENWAY LTD		6505 Detector PCB Assy			

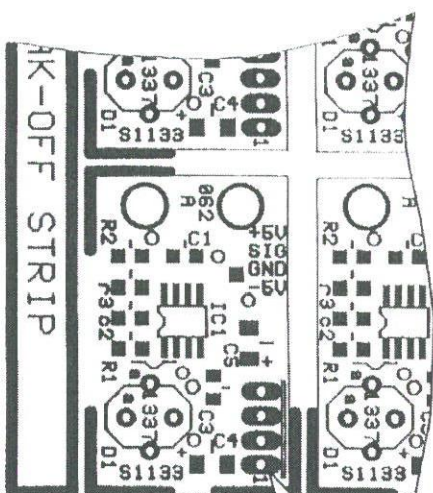
A	2175	260399	E		I		IF IN DOUBT ASK
B			F		J		DO NOT SCALE
C			G		K		THIRD ANGLE
D			H		L		PROJECTION



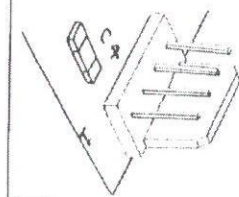
TOLERANCE UNLESS OTHERWISE STATED		SCALE	ALL DIMNS	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. (C)
			IN	
GENERAL ±		FINISH		MATERIAL
HOLE CRS. ±				
DIAMETERS ±				
ANGLES ±				
DRN. <i>AWH</i>	DATE 260399	APP'D.	DATE	DRG. REF. 650-010
JENWAY LTD			TITLE;	
Gransmore Green, Felsted, Dunmow, Essex, CM6 3LB			6500/5 BEAM SPLITTER	
Tel: 01371 820122 Fax: 01371 820946			CIRCUIT DIAGRAM	

Gransmore Green, Felsted,
Dunmow, Essex. CM6 3LB
Tel: 01371 820122 Fax: 01371 820946

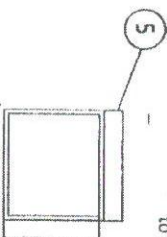
Component Side



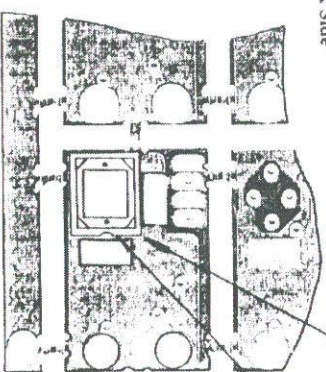
BACK-OFF STRIP



NOTE
Fit Light Shield in orientation shown and solder tabs to PCB to retain.



Track Side



NOTE
1. Please note D1 must be mounted flush to PCB.
2. Polarity of D1 is designated by an incident to the side of the package.
3. D1 is an optical component and must be clean and free from any marks.

ASSEMBLY NOTES 6500 05 BEAM SPLITTER PCB ASSEMBLY:- 650 010

- Referring to screening, re-flow and feeder list information, complete all surface mount aspects of this assembly. (Job/File Ref: 650_011).
- Follow on-screen instructions and perform MASCOF aspects of this assembly (Job/File Ref: 650_010). Alternately refer to adjacent illustrations and fit 4 way Header and Photodiode (D1) manually. Trim leads as required and solder items in place.
- Referring to adjacent illustration, fit and solder in place the Beam Splitter Light Shield (item 5).
- Inspect PCB to ensure all aspects of the assembly have been satisfactorily completed. Break apart individual boards and test the assemblies on Dedicated Test Set to Procedure 650 010.

Screening:

Use Stencil 077-262
Use Solder Paste RMD.AS90 (060-280)

Reflow:

Use Reflow Profile 002

Feeder List:

A	** Unit Not Configured **	E	** Unit Not Configured **
B	** Unit Not Configured **	F00	001-436 100K
		F01-F08	** Not Assigned **
		F09	001-437 100R
C00-C02	** Not Assigned **	G	** Unit Not Configured **
C03	002-102 220pF		
C04	** Not Assigned **	H	** Unit Not Configured **
C05	** Not Assigned **		
C06	002-089 100nF		
C07	002-090 1uF		
C08	** Not Assigned **		
C09	** Not Assigned **		
D00	** Not Assigned **		
D01	004-065		
D02-D09	** Not Assigned **		

CAUTION.
Please remember that these devices are static sensitive.
Handle and Assemble using anti-static precautions at all times.
Place completed PCB into anti-static bag provided.

A	CW2135 9/12/99	E	I	IF IN DOUBT ASK
B	CW2135 17/3/99	F	J	DO NOT SCALE
C		G	K	THIRD ANGLE PROJECTION
D		H	L	

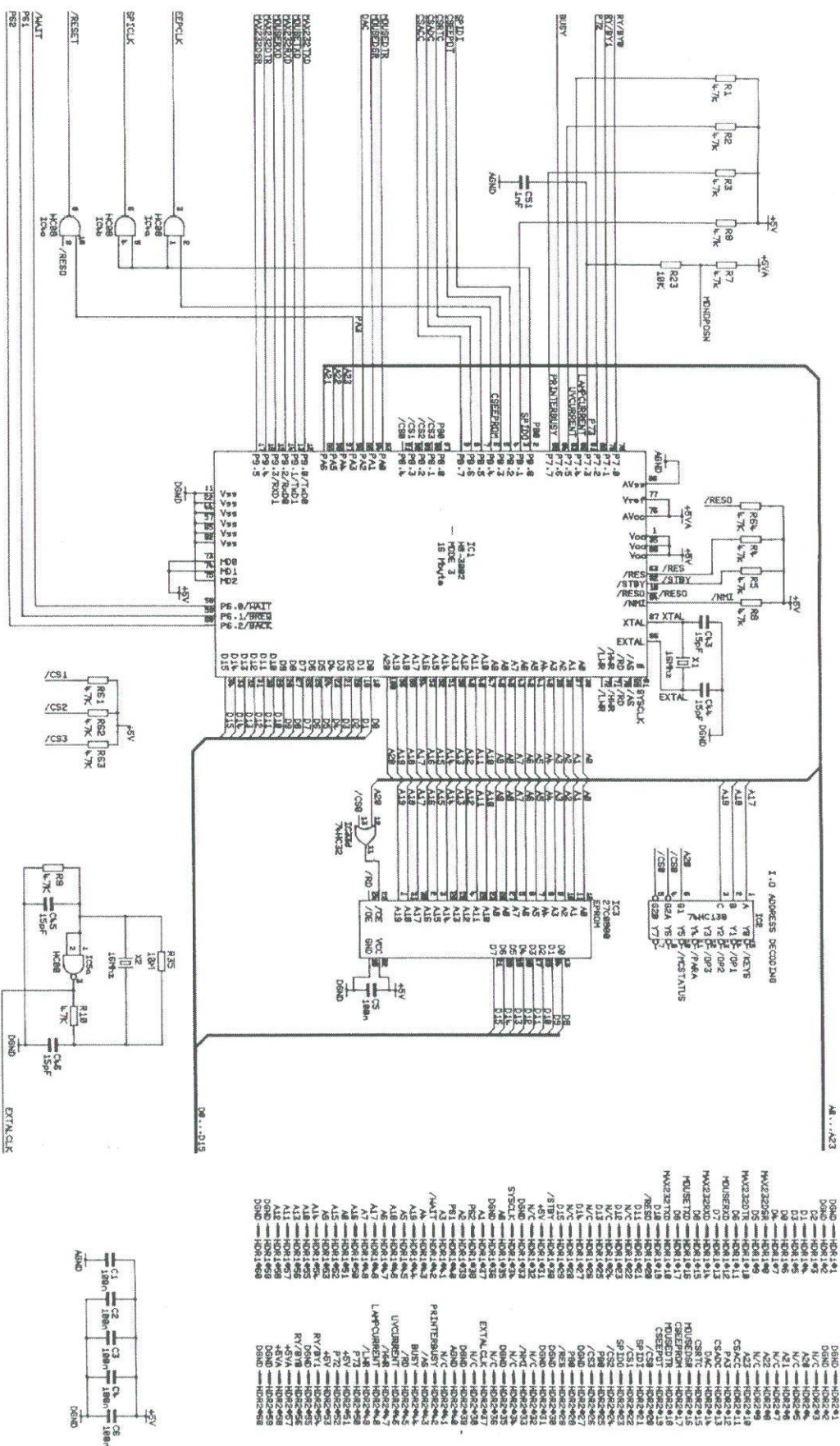
TOLERANCES UNLESS OTHERWISE STATED			
GENERAL	=	SCALE	ALL DIMS
HOLE CRS.	=	FINISH	IN
DIAMETERS	=		
ANGLES	=		
DRN. S.C.L.	DATE	APPD	CW
JENWAY LTD	22/9/99		
Grange Road, Farnham, Surrey, GU10 3LB	DATE	24-3-99	DRG. REF
Tel: 0251 320122			650-010
			ASSEMBLY DETAILS

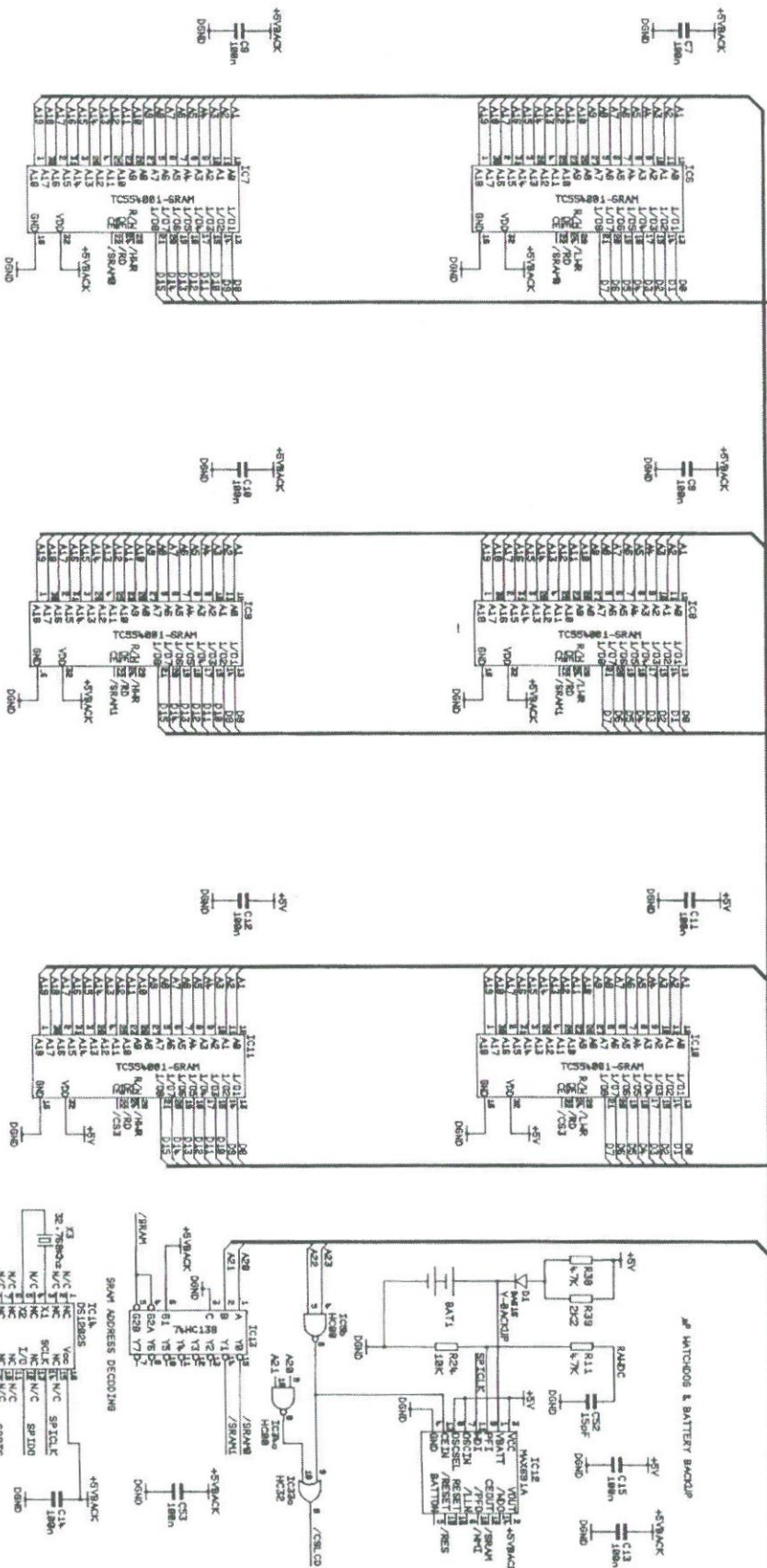
Section 9

Circuit Diagrams

- 9.40 Microprocessor PCB Schematic – 650 006
 – 6 pages

- 9.41 Microprocessor PCB Layout - 650 006
 - 1 page





512Kx18 SRAM
C30000-0FFFF

512Kx18 SRAM
D00000-0FFFF

512Kx18 SRAM
E00000-0FFFF

512Kx18 SRAM
F00000-0FFFF

512Kx18 SRAM
G00000-0FFFF

1	A	CN2175	22/2/99	E	DATE 22-2-97	APP'D CCH	DATE 8/10/98	DRN. BARDAN DESIGNS DRG. REF. 650-006	SHT 2 OF 6
2	B			F					
3	C			G					

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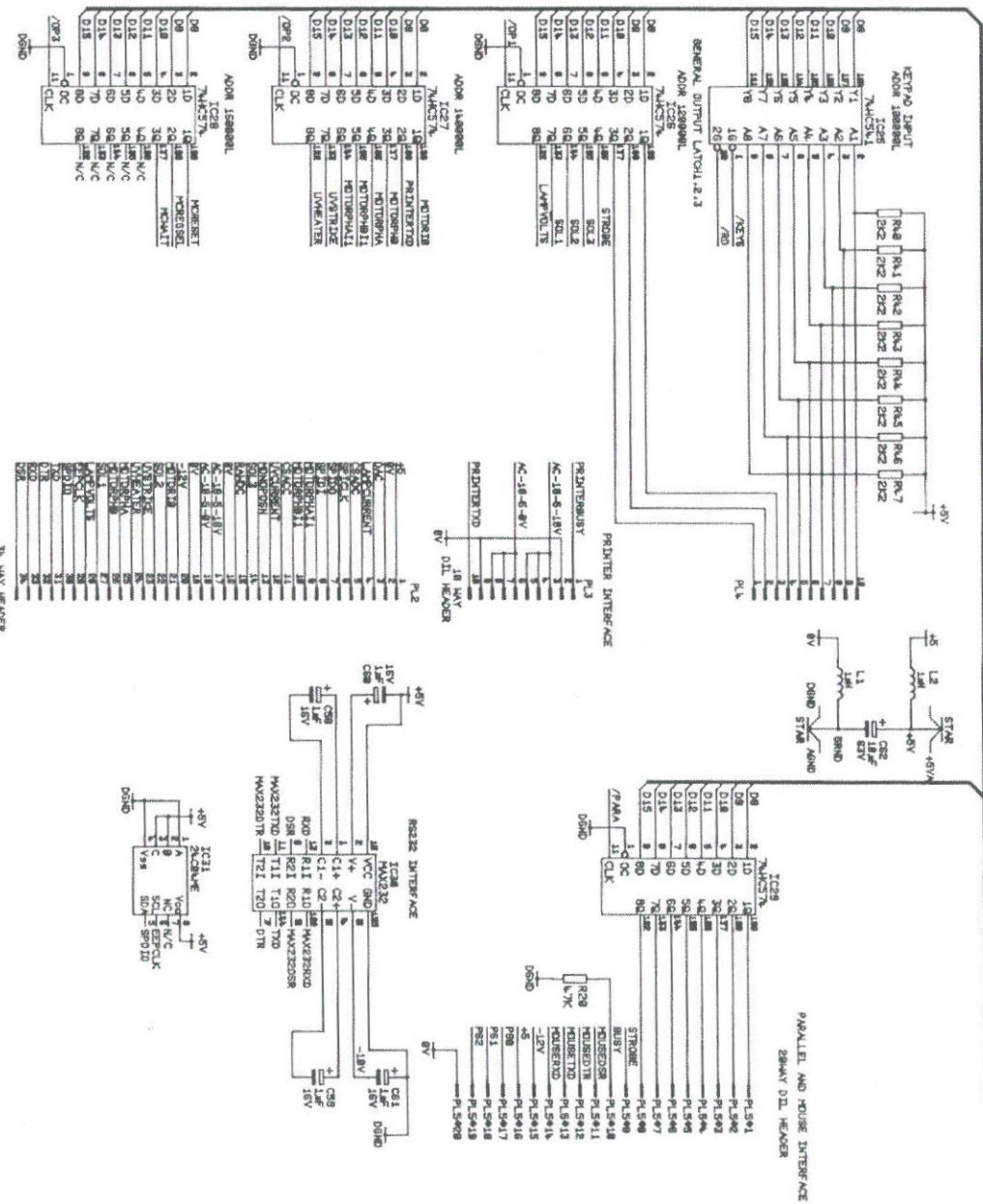
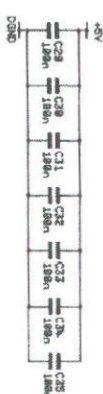
JENWAY LTD.

GROUNDSHIRE GREENFIELD, DUNDEE, SCOTLAND, CB 3LB

TITLE 6502 MICROPROCESSOR PCB



Gundamova Gerson, Felsted.
Dumnow, Essex. CMS 3LB



Ignore layout 5

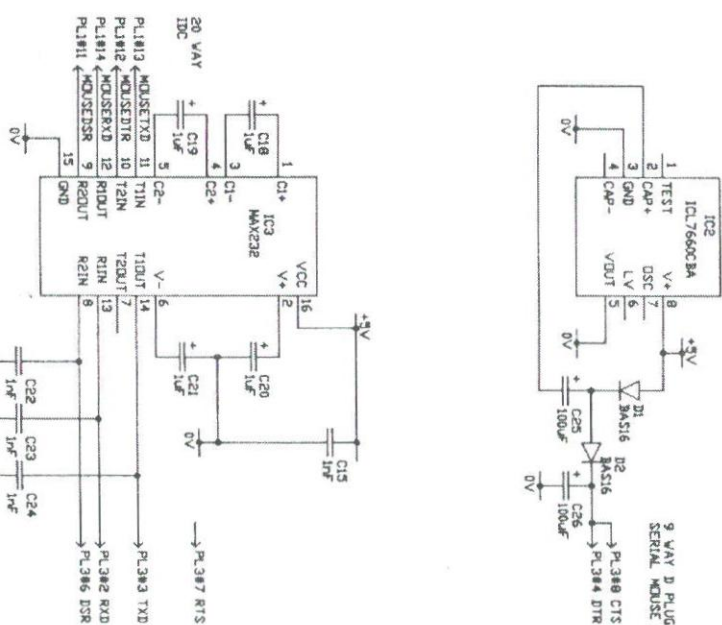
1	A	CN2175	22/2/99	E		DATE 22-2-97	APP'D CCW	DATE 8/10/98	DRN BARDAN DESIGNS DRG. REF. 650-006	TITLE	6500 MICROPROCESSOR PCB	SHT. 4 OF 6
2	B			F		This drawing is copyright and must not be reproduced or otherwise used without written permission.						
3	C			G								
	D			H								


JENWAY LTD.
Grosvenor Green, Farnham,
Dorset, Dorset, DT9 8JL
Tel: 01751 820122



Granstone Green, Felsted
Dunmow, Essex. CM6 3LB

6500 MICROPROCESSOR PCB



TOLERANCE UNLESS OTHERWISE STATED		SCALE	ALL DIMS.	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©
GENERAL	±	FINISH	IN	
HOLE CRS.	±			
DIAMETERS	±			
ANGLES	±			
DWG. REF.	650 012			
DRN.	CCV	DATE 7/10/98	APPROVED 	
JENWAY LTD		DATE 22/6/99		TITLE
Grassmore Green, Farnfield, Dunmore, Essex, CM6 3LB Tel: 01371 860122 Fax 01371 860946		6500/05 MOUSE/INTERFACE CIRCUIT DIAGRAM		

ASSEMBLY NOTES MOUSE INTERFACE PCB ASSEMBLY :- 650 012

- Referring to screening, re-flow and feeder list information, complete all surface mount aspects of this assembly (Job File Ref: 650 013).
- Follow on screen instructions and perform 'MASCOT' aspects of this assembly (Job File Ref: 650 012).
- Inspect PCB to ensure all aspects of the assembly have been satisfactorily completed. Test in accordance with 650-012.

Screening :

Use stencil 077-263
Use Solder Paste RM2AAS90 (060-280)

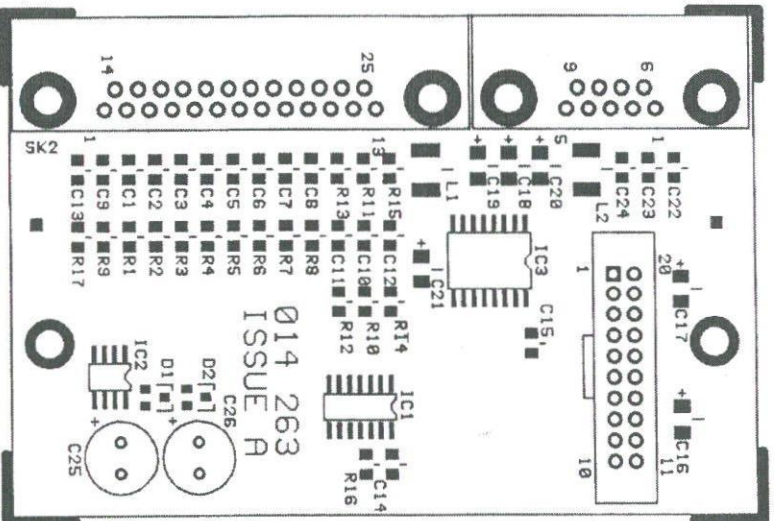
Reflow :

Use Reflow Profile 002

Feeder List :

A	Unit Not Configured	F00	Not Assigned
B00	Not Assigned	F01	Not Assigned
B01	010-023 10uH	F02	002-094 1uF
B02 thro B06	Not Assigned	F03	Not Assigned
		F04	Not Assigned
C00	001-380 47K	F05	Not Assigned
C01	Not Assigned	F06	Not Assigned
C02	Not Assigned	F07	Not Assigned
C03	Not Assigned	F08	Not Assigned
C04	001-412 1M	F09	001-316 100R
C05	Not Assigned	G00	Not Assigned
C06	002-089 100nF	G01	Not Assigned
C07	002-090 1uF	G02	Not Assigned
C08	005-029 BAS16	G03	Not Assigned
C09	Not Assigned	G04	002-099 100pF
D00 thro D03	Not Assigned	G05 thro G09	Not Assigned
D04	018-054	H00 thro D07	Not Assigned
D05 thro D08	Not Assigned	H08	019-067
D09	020-024	H09	Not Assigned

E Unit Not Configured



CAUTION.

Please remember that these devices are static sensitive
Handle and Assemble using anti-static precautions at all times.
Place completed PCB into anti-static bag provided.

A	21/25	12/11/98	E	I	IF IN DOUBT ASK
B			F	J	DO NOT SCALE
C			G	K	THIRD ANGLE
D			H	L	PROJECTION

TOLERANCES UNLESS OTHERWISE STATED		SCALE	ALL DIMS	This drawing is copyright and must not be reproduced or otherwise made use of without written permission		MATERIAL
GENERAL	±	FINISH	IN			
HOLE CRS.	±					
DIAMETERS	±					
ANGLES	±					
DRN. S.R.L.	DATE 12/11/98	APPO. C.W.	DATE 30-3-99	DRG. REF.	650 012	
JENWAY LTD						
Gransmore Green, Felsted, Dunmow, Essex. CM8 3LB						
Tel: 0371 820122						
Mouse Interface PCB Assy						

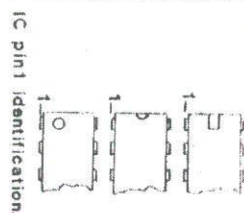
Section 9

Circuit Diagrams

- 9.60 Accessory Driver PCB Schematic – 642 003 –
 1 page

- 9.61 Accessory Driver PCB Layout – 642 003 –
 1 page

FIG 1



IC pin1 identification.

FIG 2

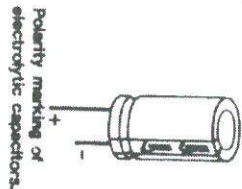


FIG 3

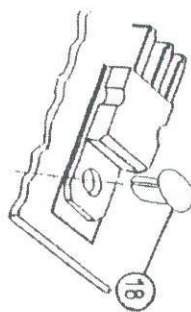


FIG 4

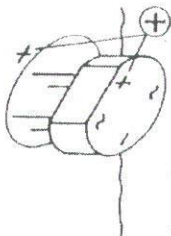


FIG 5



FIG 6

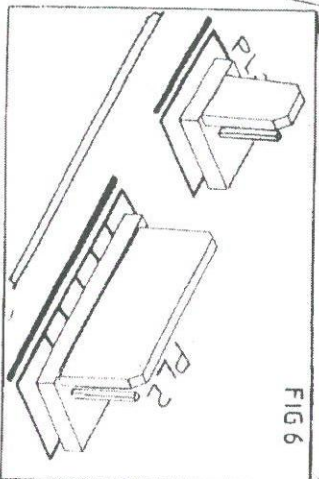
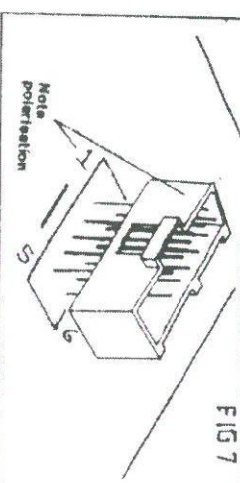


FIG 7



CAUTION. Assemble using static precautions. Place completed PCB into bag provided. These devices are static sensitive.

ASSEMBLY NOTES: 6400/5 Accessory PCB Assembly: 642-003

- 1) Referring to Feeder List & Screening and Reflow information, complete all surface mount aspects of this assembly (JobFile Ref 642-004).
- 2) Fit Terminal Pin in position TP1 such that it protrudes from Component side of PCB. Solder in place.
- 3) Fit Resistors in positions R14, R17 & R18. Cut leads to length and solder.
- 4) Referring to FIG 5, fit Diode D1 in position indicated. Cut leads to length and solder.
- 5) Referring to FIG 1, fit Integrated Circuits IC3 & IC6. Fit IC Socket in position IC4. Solder all pins.
- 6) Referring to FIG 4, fit Bridge Rectifier BR1 in position indicated. Cut leads to length and solder.
- 7) Fit Capacitors C19 & C24 in positions indicated. Cut leads to length and solder.
- 8) Referring to FIG 6, fit Connectors PL2 & PL3 as indicated. Solder all pins.
- 9) Referring to FIG 7, fit Connector PL1 as indicated. Solder all pins.
- 10) Referring to FIG 2, fit Capacitors C11, C16, C20, C21 & C25 in positions indicated. Cut leads to length and solder.
- 11) Referring to FIG 3, fit Regulators REG1 & REG2 and retain with fixings indicated. Tighten fixings, trim leads to length and solder.
- 12) Inspect PCB to ensure that all components (including Surface Mount) are correctly fitted and that polarities are correct. Test in accordance with 642-003 and adhere batch code label. Place completed PCB in Static Safe bag.

FEEDER LIST

A	Unit not configured	F00	Not assigned
B00	010-023 10uH	F01	002-095 10nF
B01 thro B03	Not assigned	F02	002-094 1nF
B04	002-098 4u7	F03 thro F05	Not assigned
B05	034-006 12M	F06	001-364 10K
B06	Not assigned	F07	Not assigned
		F08	001-340 1K
		F09	001-350 2K7
C00	001-380 47K	G00 thro G07	Not assigned
C01 thro C06	Not assigned	G08	002-101 15nF
C07	002-090 1uF	G09	003-034
C08 & C09	Not assigned		
D00 thro D05	Not assigned	H00 thro H03	Not assigned
D06 & D07	019-063	H04	019-068
D08 & D09	Not assigned	H05 thro H09	Not assigned
E00 thro E24	019-055		
E25 thro E49	Not assigned		

Screening:

Use Spec'd 077-256
Use Solder Paste RM24AAS90 (060-280)

Reflow:

Use Profile 005

TOLERANCES UNLESS OTHERWISE STATED

GENERAL	=	SCALE	ALL DIMS	This drawing is copyright and must not be reproduced or otherwise made use of without written permission.
HOLE CRS.	=	WT5	IN	
DIAMETERS	=			
ANGLES	=			

FINISH		MATERIAL	

DRN. S.P.L.	DATE 6/1/97	APPD. ME	DRAWING NO.	DES. REF.	642-003
JENWAY LTD	3 Mansmore Green, Farnham, Surrey, GU10 3EE	6420/5	ACCESSORY	PCB ASSY	

IF IN DOUBT ASK	DO NOT SCALE	THIRD ANGLE	SEQUENCE



Section 10

Assembly Diagrams

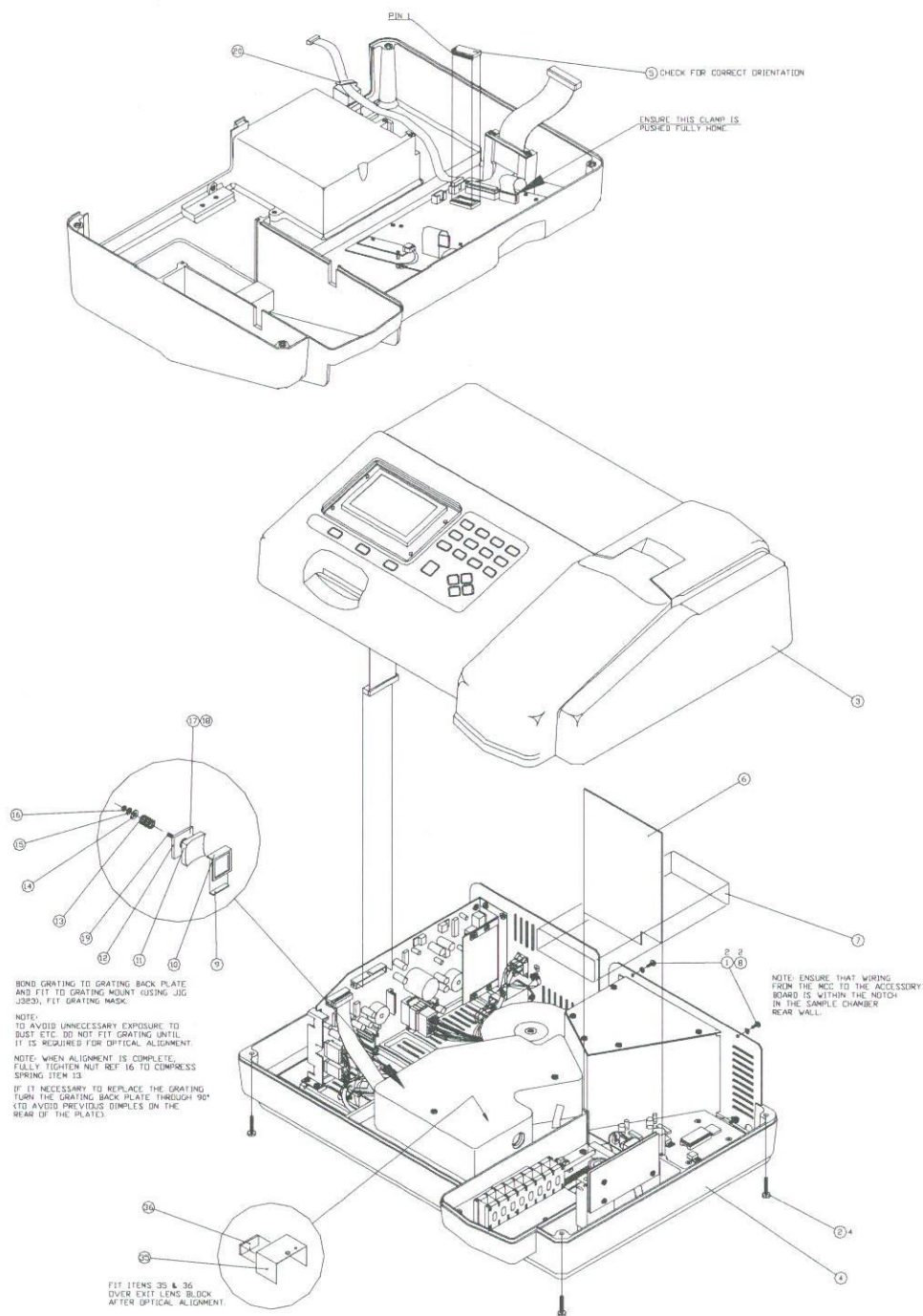
- 10.1 6500 Final Assembly 650 003
- 10.2 6505 Final Assembly 650 503
- 10.3 6500 Lower Case Assembly 650 005
- 10.4 6505 Lower Case Assembly 650 504
- 10.5 6500/05 Top Case Assembly 650 004
- 10.6 6500 Optics Assembly 650 016
- 10.7 6505 Optics Assembly 650 507
- 10.8 6500/05 Rear Panel Assembly 650 018
- 10.9 6500/05 Multi-cell Changer Assembly 644 002

Section 10

Assembly Diagrams

10.1 6500 Final Assembly – 650 003

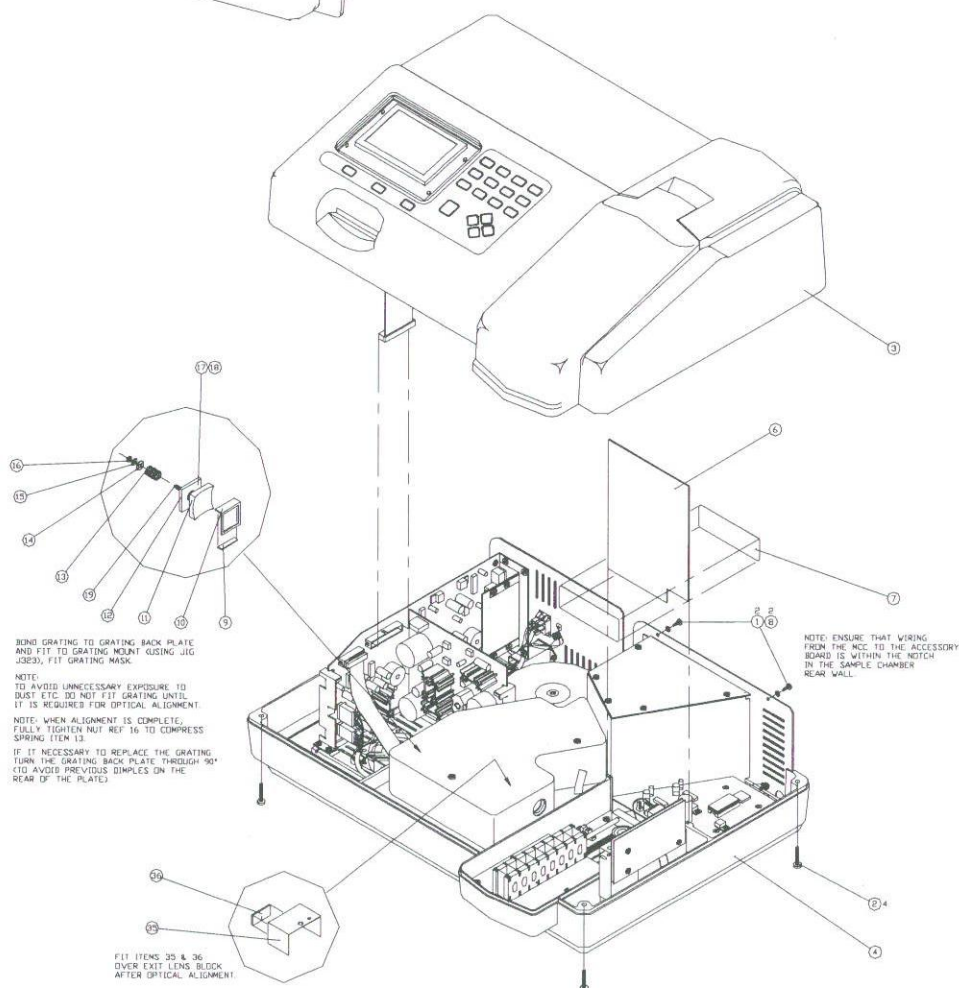
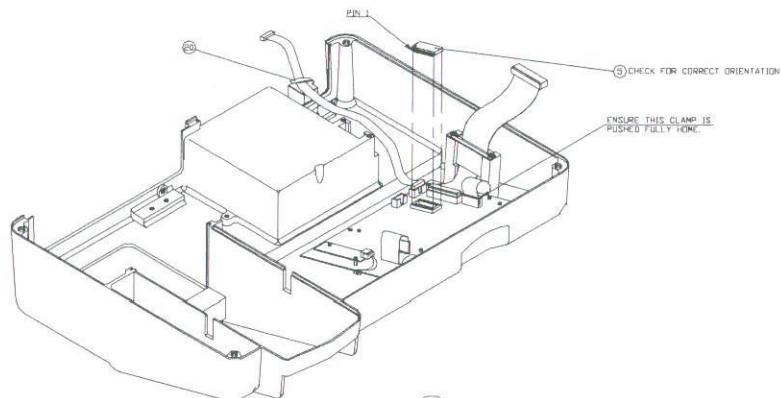
10.2 6505 Final Assembly – 650 503



A	2175	290998	E	2216	140599	I		IF IN DOUBT ASK
B	2194	181198	F			J		DO NOT SCALE
C	2175	221298	G			K		THIRD ANGLE
D	2175	170399	H			L		PROJECTION



TOLERANCE UNLESS OTHERWISE STATED		SCALE	ALL DIMNS	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©
GENERAL		3/8	IN MM	
HOLE CRS		FINISH		MATERIAL
DIAMETERS				
ANGLES				
DRN <i>Robert Bailey</i> DATE 290998		APPD	DATE	DRG. REF. 650-003
JENWAY LTD		Granspore Green, Felsted, Dunmow, Essex CM9 3JL		TITLE FINAL ASSEMBLY
Tel: 01371 820122 Fax: 01371 820946				6500 SPECTROPHOTOMETER



A	2175	298998	E	2216	140599	I		IF IN DOUBT ASK
B	2194	181198	F			J		DO NOT SCALE
C	2175	221298	G			K		THIRD ANGLE
D	2175	170399	H			L		PROJECTION

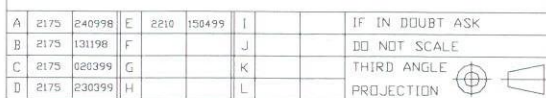
TOLERANCE UNLESS OTHERWISE STATED		SCALE	ALL DIMNS.	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©	
GENERAL		3/8	IN MM		
HOLE CRS		FINISH	-	MATERIAL -	
DIAMETERS					
ANGLES					
DRN <i>Robin Bailey</i>		DATE 290998	APPD.	DATE	DRG. REF. 650-503
JENWAY LTD		Gransmore Green, Felsted, Dunmow, Essex. CM6 3LB Tel: 01371 820122 Fax: 01371 820946		TITLE FINAL ASSEMBLY 6505 SPECTROPHOTOMETER	

Section 10

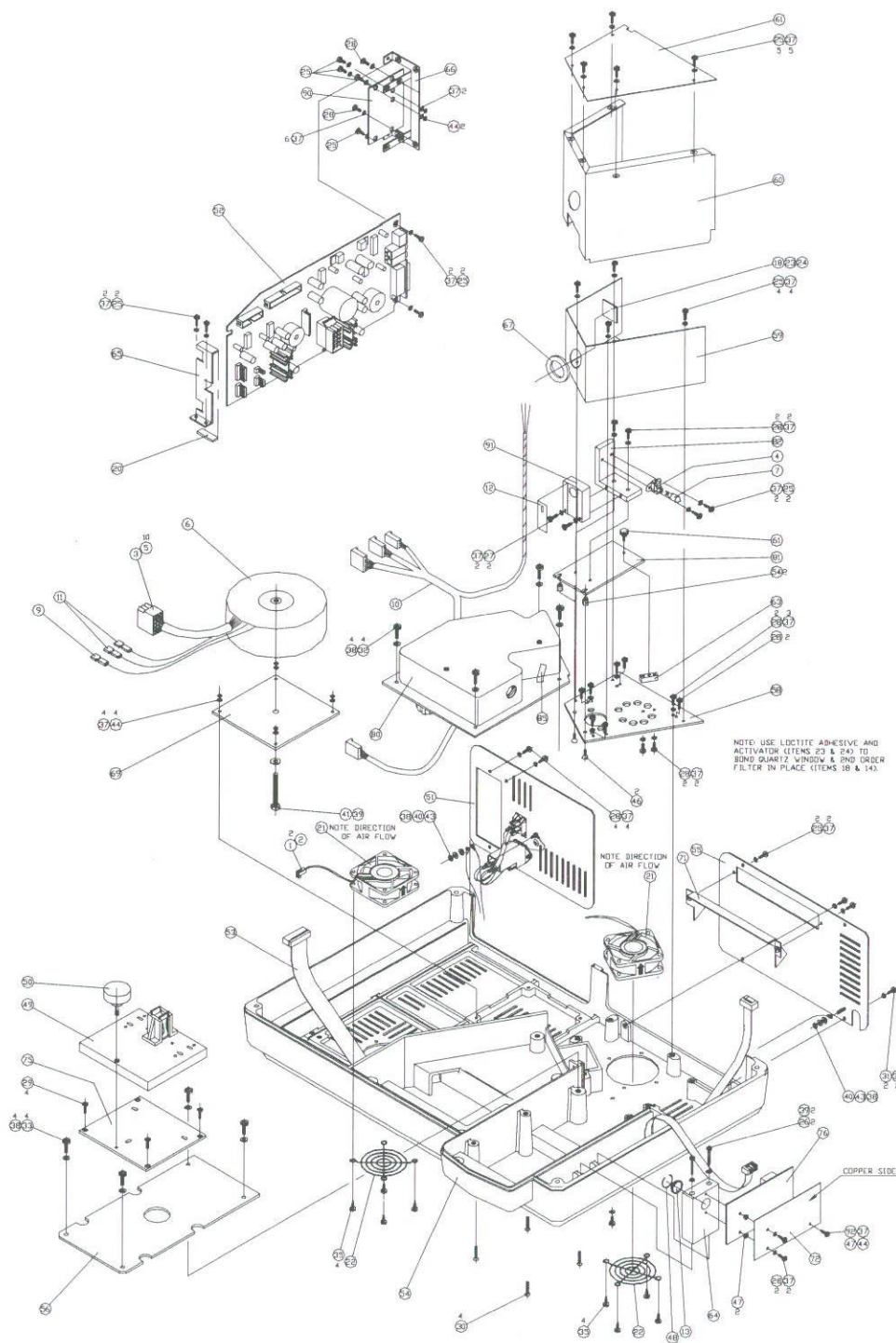
Assembly Diagrams

10.3 6500 Lower Case Assembly – 650 005

10.4 6505 Lower Case Assembly – 650 504



JENWAY LTD Gransnore Green, Feasted,
Dunmow, Essex. CM6 3LB
Tel: 01371 820122 Fax: 01371 820946



TOLERANCE UNLESS OTHERWISE STATED						SCALE	ALL DIMNS.	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©
GENERAL						3/8	IN MM	
HOLE CRS.						FINISH	-	MATERIAL
DIAMETERS								
ANGLES								
A	2154	281197	E	2210	130499	I		
B	2175	131198	F			J		
C	2175	020399	G			K		
D	2175	230399	H			L		

IF IN DOUBT ASK

DO NOT SCALE

THIRD ANGLE

PROJECTION



DRN *Len Shado*

DATE 281197

APPD

DATE

DRG. REF. 650-005 SHT.2

JENWAY LTD

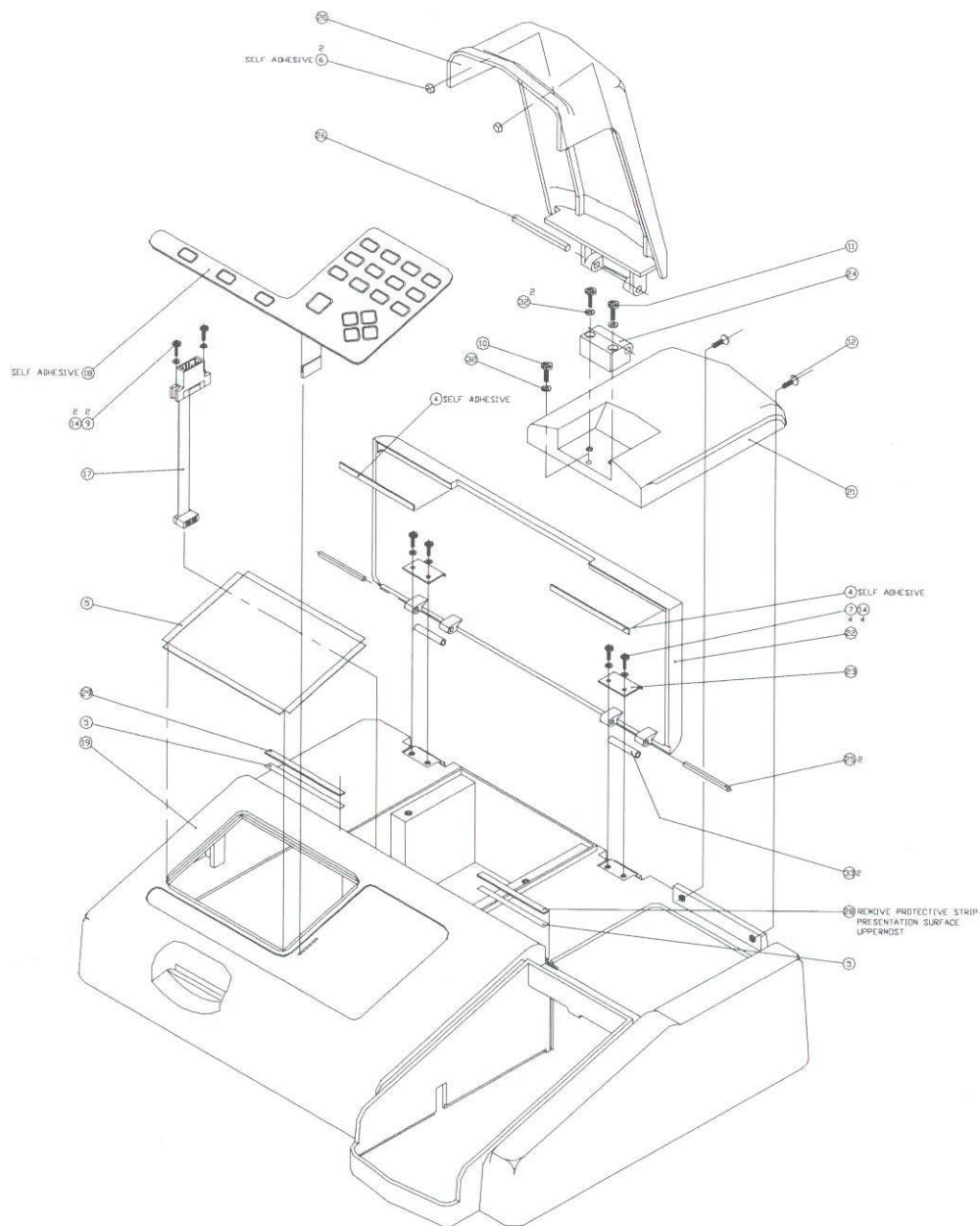
Granshore Green, Felsted,
Dunmow, Essex CM6 3LB
Tel: 01371 820122 Fax: 01371 820946

TITLE LOWER CASE ASSEMBLY
6500 SPECTROPHOTOMETER

Section 10

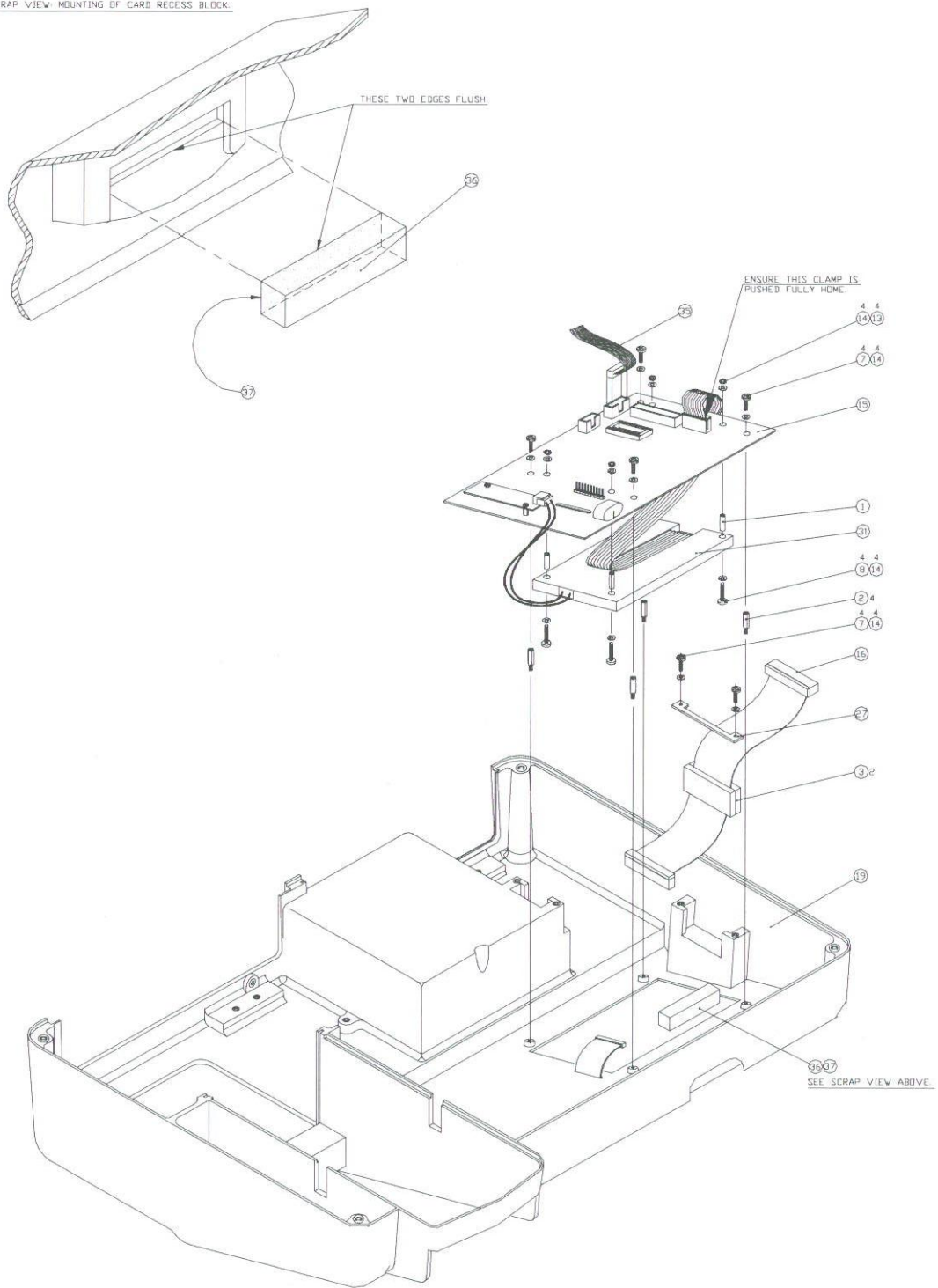
Assembly Diagrams

10.5 6500/05 Top Case Assembly – 650 004



				TOLERANCE UNLESS OTHERWISE STATED				SCALE	ALL DIMS	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©
				GENERAL					IN MM	
				HOLE CRS. ±				FINISH		
A	2175	290998	E							MATERIAL
B	2175	221298	F							
C	2175	190399	G							
D			H							
				DIAMETERS ±						
				ANGLES ±						
				DRN: 02214/01 DATE 290998				APPD.	DATE	DRG REF. 650-004 SHT.1
				JENWAY LTD				TITLE TOP CASE ASSEMBLY		
				Gransmore Green, Felsted, Dunmow, Essex CM6 3LB Tel: 01371 820122 Fax: 01371 820946				6505/6500 SPECTROPHOTOMETER		

SCRAP VIEW: MOUNTING OF CARD RECESS BLOCK.



A	2175	290998	E		I		IF IN DOUBT ASK
B	2175	221298	F		J		DO NOT SCALE
C	2175	190399	G		K		THIRD ANGLE
D			H		L		PROJECTION



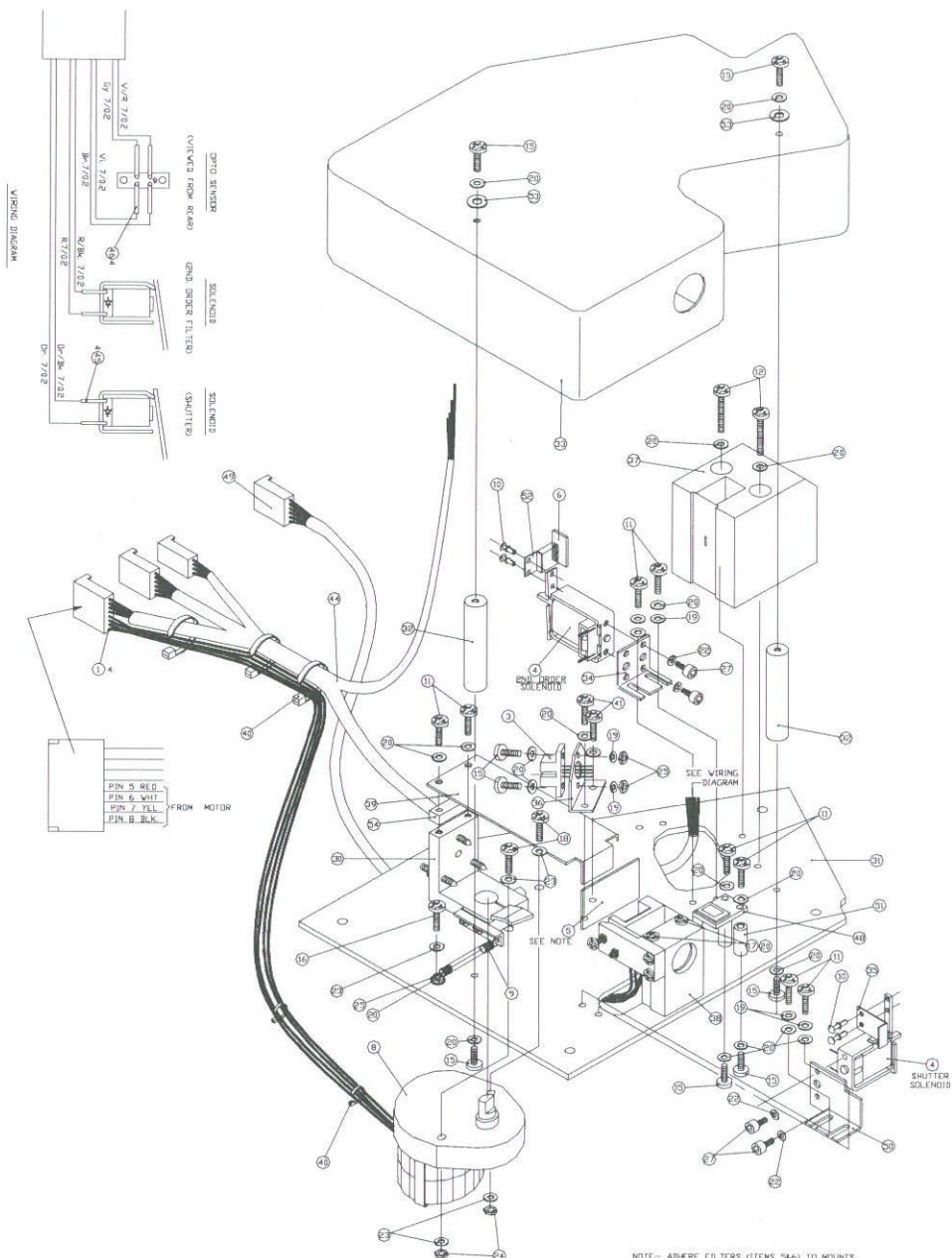
TOLERANCE UNLESS OTHERWISE STATED		SCALE	ALL DIMS IN MM	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©
GENERAL	±	FINISH		
HOLE CRS.	±	MATERIAL		
DIAMETERS	±			
ANGLES	±			
DRN <i>Robin Bailey</i>	DATE 290998	APPD.	DATE	DRG. REF. 650-0042
JENWAY LTD		Gransmore Green, Felstead, Dunmow, Essex. CM6 3LB		TITLE TOP CASE ASSEMBLY
		Tel: 01371 820122 Fax: 01371 820946		6505/6500 SPECTROPHOTOMETER

Section 10


Assembly Diagrams

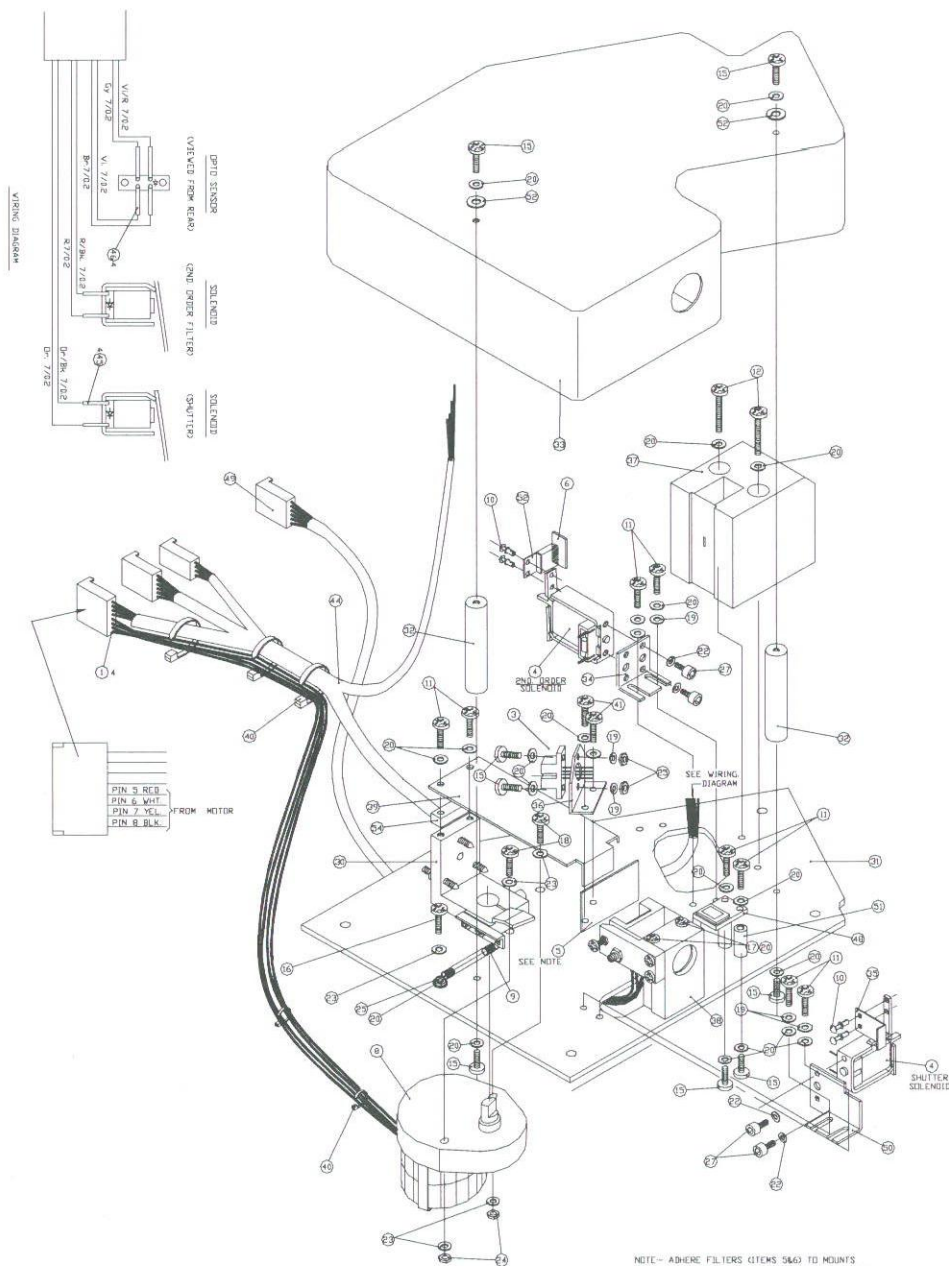
10.6 6500 Optics Assembly – 650 016

10.7 6505 Optics Assembly – 650 507



NOTE:- ADHERE FILTERS (ITEMS 3&6) TO MOUNTS
USING ACTIVATOR (ITEM 43) & ADHESIVE (ITEM 42).
NOTE: IT IS IMPORTANT THAT ALL COMPONENTS
(PARTICULARLY OPTICAL COMPONENTS) ARE KEPT AS
CLEAN AS POSSIBLE.

TOLERANCE UNLESS OTHERWISE STATED										SCALE		ALL DIMS		This drawing is copyright and must not be reproduced or otherwise made use of without written permission. (C)
GENERAL										1:1		IN MM		
HOLE CRS.										FINISH		MATERIAL		
DIAMETERS														
ANGLES														
A	2175	240998	E	2175	220399	I		IF IN DOUBT ASK	DRN <i>Robin Bailey</i> DATE 240998		APPD	DATE	DRG. REF. 650-016	
B	2194	181198	F	2210	220499	J		DO NOT SCALE	JENWAY LTD		Granspore Green, Felstead, Dunmow, Essex CM6 3LB Tel: 01371 820122 Fax: 01371 820946		TITLE 6500 OPTICS ASSEMBLY	
C	2175	122198	G			K		THIRD ANGLE						
D	2175	200199	H			L		PROJECTION						



TOLERANCES UNLESS OTHERWISE STATED									
GENERAL									
HOLE CRS.									
DIAMETERS									
ANGLES									
DRN. <i>Robin Bailey</i> DATE 240998 APPD.									
DATE 240998									
JENWAY LTD									
Granshore Green, Felsted, Dunmow, Essex CM6 3LB									
Tel: 01371 820122 Fax: 01371 820946									
SCALE 1:1 ALL DIMNS. IN MM									
FINISH									
MATERIAL									
DATE									
DRG. REF. 650-507									
TITLE 650S OPTICS ASSEMBLY									

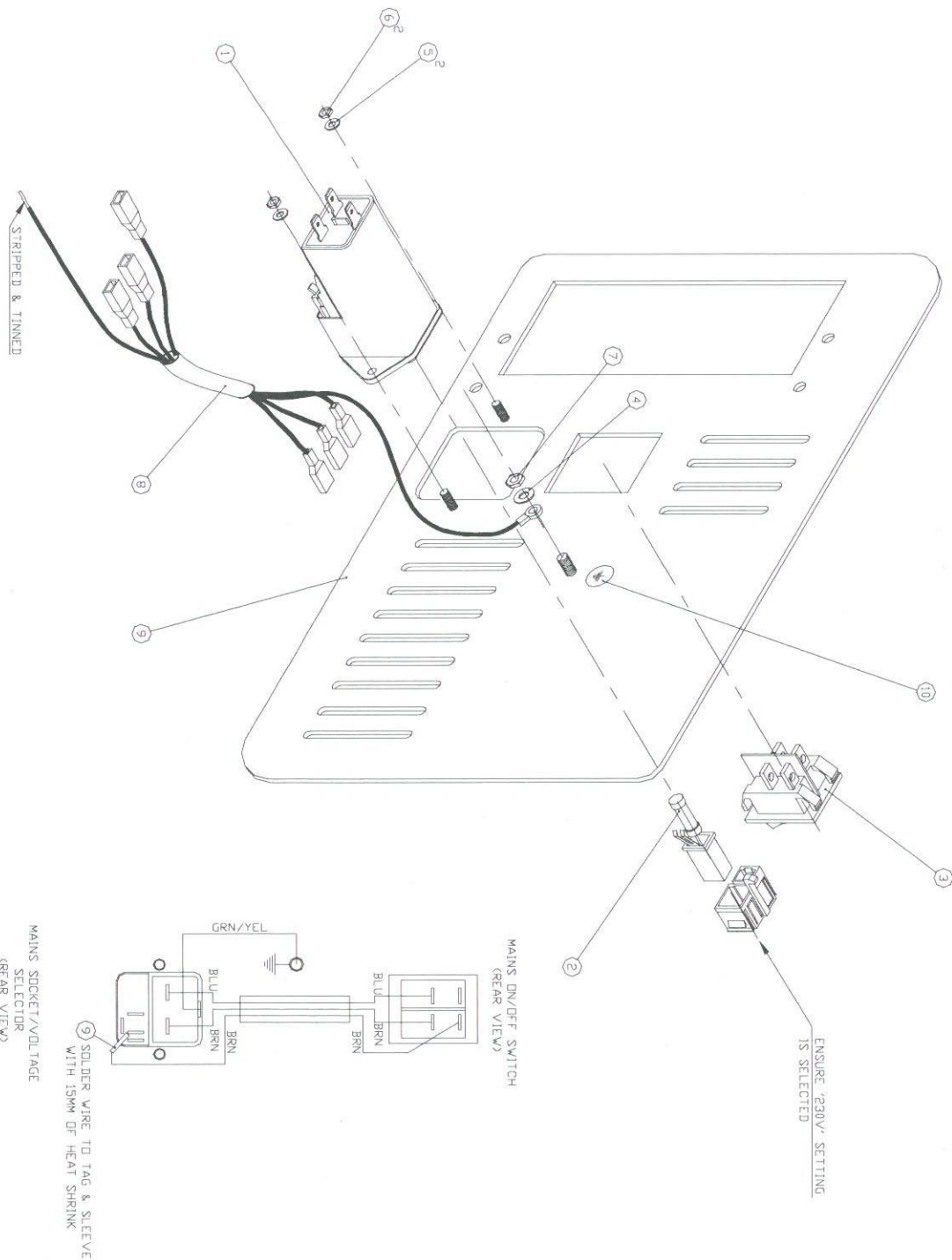
A	2175	240998	E	2175	230399	I		IF IN DOUBT ASK
B	2194	191198	F	2210	220499	J		DO NOT SCALE
C	2175	211298	G			K		THIRD ANGLE
D	2175	200199	H			L		PROJECTION

Section 10

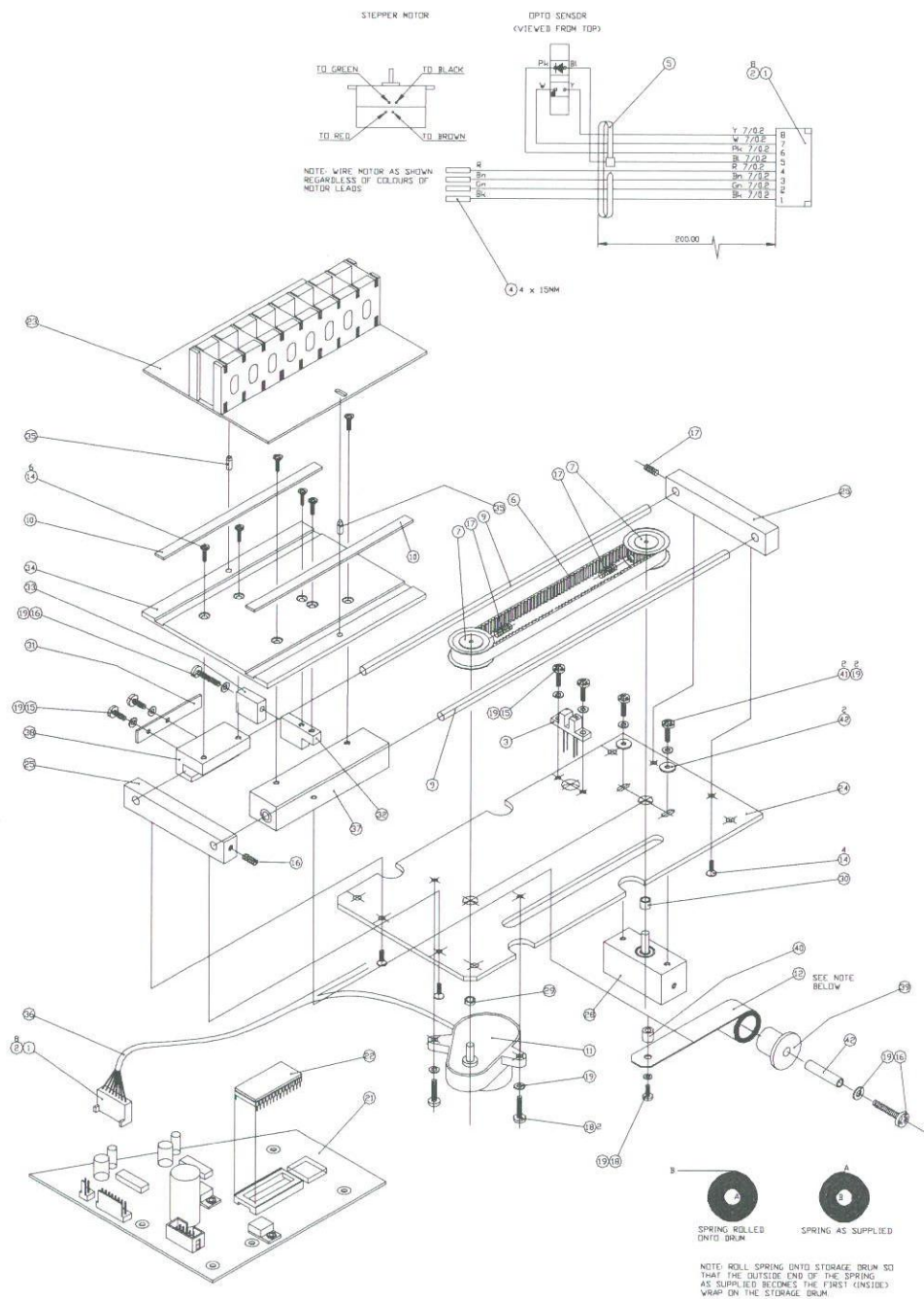
Assembly Diagrams

10.8 6500/05 Rear Panel Assembly – 650 018

10.9 6500/05 Multi-cell Changer Assembly –
644 002



TOLERANCE UNLESS OTHERWISE STATED										SCALE		ALL DIMNS		This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©			
GENERAL										NTS		IN MM					
HOLE CRS.										FINISH		-		MATERIAL			
DIAMETERS										-		-		-			
ANGLES										-		-		-			
DRN. Robin Bailey										DATE 290998		APPD.		DATE		DRG. REF: 650-018	
JENWAY LTD										Granshore Green, Felsted, Buryton, Essex, CM8 3LB		Tel: 01371 820122 Fax: 01371 820946		TITLE REAR PANEL ASSEMBLY		6500/6505 SPECTROPHOTOMETER	



TOLERANCE UNLESS OTHERWISE STATED										SCALE	ALL DIMMS.	This drawing is copyright and must not be reproduced or otherwise made use of without written permission. ©			
GENERAL : HOLE CRS : DIAMETERS : ANGLES :										FINISH	IN				
										-		MATERIAL	-		
A	2154	070198	E	2172	220698	I			IF IN DOUBT ASK	DRN <i>Len Chasle</i>		DATE 07/01/98	APPD.	DATE	DRG. REF. 644-002
B	2165	050398	F	2184	010998	J			DO NOT SCALE	Grosvenor Green, Felsted, Dunmoe, Essex CM6 3LB					
C	2165	200398	G	2205	290399	K			THIRD ANGLE	Tel: 01371 820122 Fax: 01371 820946					
D	2172	080698	H	2218	190599	L			PROJECTION	JENWAY LTD					

Section 11

Spare Parts

- 11.01 Packed Instrument
- 11.02 Top Case Assembly
- 11.03 Microprocessor PCB
- 11.04 Lower Case Assembly
- 11.05 Lamp Housing Assembly
- 11.06 Monochromator Assembly
- 11.07 Detector PCB
- 11.08 Power Supply PCB
- 11.09 Deuterium Lamp Supply PCB
- 11.10 Rear Panel Assembly
- 11.11 Mouse/Parallel Port PCB
- 11.12 Multi-Cell Changer PCB
- 11.13 Built-In Printer Option

6500/05 SPARE PARTS LIST

Part Number	Drwg/Cct Ref	Description
-------------	-----------------	-------------

Section 11.01

650 501 Packed Instrument.

033 243		Packing case complete with inserts
060 084		Disposable cuvettes (4ml) pack of 100
060 358		Serial mouse
060 361		Mouse mat
650 050		Instruction manual
013 046		Mains cable without plug
013 083		Mains Cable U.S.A. plug
013 123		Mains Cable European plug
013 181		Mains Cable U.K. plug
TBA		Service Manual

Section 11.02

650 004 Top Case Assembly.

640 058		6400 / 6500 Series membrane keypad
650 021		PCMCIA card with current version software

Section 11.03

650 006 Microprocessor PCB.

650 006		Micro-processor PCB
TBA		Service Exchange 6500 / 05 uprocessor PCB
002 114	C68, C69	220uF 35V radial capacitor low ESR
005 014	BR1	Bridge Rectifier WO2
006 172	PL1	68 way memory card connector
020 028	Reg1	L4962 Voltage regulator
021 018	Bat1	PCB mount battery 3.6V
060 357	M1	LCD inverter SP14Q002
012 092		LCD Module SP14Q002
650 056	IC3	Boot EPROM

Section 11.04

650 504 Lower Case Assembly.

010 039		Torroidal transformer assembly
060 040		Large rubber feet
060 342		Cooling fan 12V 60mm
640 137		Rear Foot

Section 11.05

Lamp Housing Assembly.

009 063		Tungsten halogen lamp base
012 075		Tungsten halogen lamp
640 508		Deuterium lamp assembly
032 005		Solenoid 12V dc

Section 11.06

TBA		<u>650 507 Monochromator Assembly.</u>
TBA		Monochromator assembly
012 089		Service exchange monochromator assembly
032 005		Chassis mount optocoupler
650 010		Solenoid 12V dc
TBA		Beam splitter PCB assy
012 055		Service exchange beam splitter PCB assy.
		Photodetector

Section 11.07

650 505		<u>650 505 Detector PCB.</u>
TBA		Detector PCB assembly
002 054	C1, 13, 14	Service exchange detector PCB assembly
012 055	D1	470uF 16V radial electrolytic capacitor
020 002	Reg2	Photodetector
020 006	Reg1	Voltage regulator 79L05
		Voltage regulator 7805

Section 11.08

640 025		<u>640 025 Main Power Supply PCB.</u>
TBA		Main power supply PCB
002 070	C25, 26	Service exchange main power supply PCB
005 024	D1	1000uF 25V radial electrolytic capacitor
002 112	C1	Bridge rectifier
016 054	F4, 5	4700uF 40V radial electrolytic capacitor
016 057	F2, 3	2.5A resettable fuse
016 061	F1	0.2A resettable fuse
020 019	Reg4	7.0A resettable fuse
020 027	Reg2, 3	Voltage regulator 7812
020 028	Reg1	L4960 voltage regulator
020 035	Reg5	L4962 voltage regulator
006 115	SK2	L7918CV voltage regulator
006 154	SK13	25 way D socket
009 124	SK10	6 way miniature DIN socket
009 125	SK11	4mm socket red
		4mm socket black

Section 11.09

640 516		<u>640 516 Deuterium Lamp Power Supply</u>
TBA		Deuterium lamp power supply
005 024	BR1, 100	Service exchange deuterium lamp power supp.
032 006	RLY1	Bridge rectifier 4A
020 004	Reg2	Relay single pole changeover 12V
020 016	Reg100	Voltage regulator 78L05
020 019	Reg1	Voltage regulator TL431
002 038	C14	Voltage regulator 7812
002 054	C102, 103	100uF 25V radial electrolytic capacitor
002 112	C1,100	470uF 16V radial electrolytic capacitor
002 114	C8, 9	4700uF 40V radial electrolytic capacitor
002 115	C11	220uF 35V radial capacitor low ESR
002 116	C107	2200uF 16V radial capacitor low ESR
		470uF 200V radial capacitor low ESR

Section 11.10

009 123		650 018 Rear Panel Assembly.
016 058		Mains input socket
017 050		1.6A fuse 20mm (T) (for 220V supply)
016 007		Switch rocker 2p
		3.15A Fuse 20mm (T) (for 110V supply)

Section 11.11

650 012		650 012 Mouse Interface PCB
TBA		Mouse interface PCB
006 175	PL3	Service exchange mouse interface PCB
006 115	SK2	9 way D type plug
002 038	C25, 26	25 way D type socket
		100uF 25V radial electrolytic capacitor

Section 11.12

644 001		644 002 Multi-cell Changer with PCB
TBA		Multi-cell changer complete with PCB
012 089		Service exchange multi-cell changer with PCB
036 023		IR Chassis mount opto-coupler
060 344		Timing belt 2.5x330x6
060 345		Stepper motor
002 018	C16, C21	Constant force spring
002 073	C20, C25	220uF 25V radial electrolytic capacitor
002 082	C11	4.7uF 35V radial electrolytic capacitor
005 014	BR1	2200uF 35V radial electrolytic capacitor
020 006	Reg1	Bridge rectifier WO2
020 019	Reg2	+5V regulator 7805
644 003		12V regulator 7812
644 026		8 position cell holder
644 027		Cell retaining spring clip
		Cell wall

Section 11.13

641 001		641 002 Built In Printer Option
TBA		Built-in printer option
060 287		Service exchange built-in printer module
060 338		Paper roll for 40 column printer
060 339		40 column printer mechanism
641 010		40 column printer module
TBA		Printer PCB
002 054		Service exchange printer PCB
002 112	C9	470uF 16V radial electrolytic capacitor
002 114	C2, 6	4700uF 40V radial electrolytic capacitor
002 115	C5	220uF 35V radial electrolytic capacitor
005 024	BR1	2200uF 16V radial electrolytic capacitor
016 054	F1	Bridge rectifier 4A
020 006	Reg1	2.5A resettable fuse
020 019	Reg2	Voltage regulator 7805
005 040	D1	Voltage regulator 7812
		High speed diode BYW80-200